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Memoirs of the Museum of Comparative Zoölogy  
AT HARVARD COLLEGE.

VOL. XLIII. PART 2.

# THE AMERICAN CHARACIDAE.

BY

CARL H. EIGENMANN.

WITH TWENTY-TWO PLATES.



CAMBRIDGE, U. S. A.:  
Printed for the Museum.  
JANUARY, 1918.



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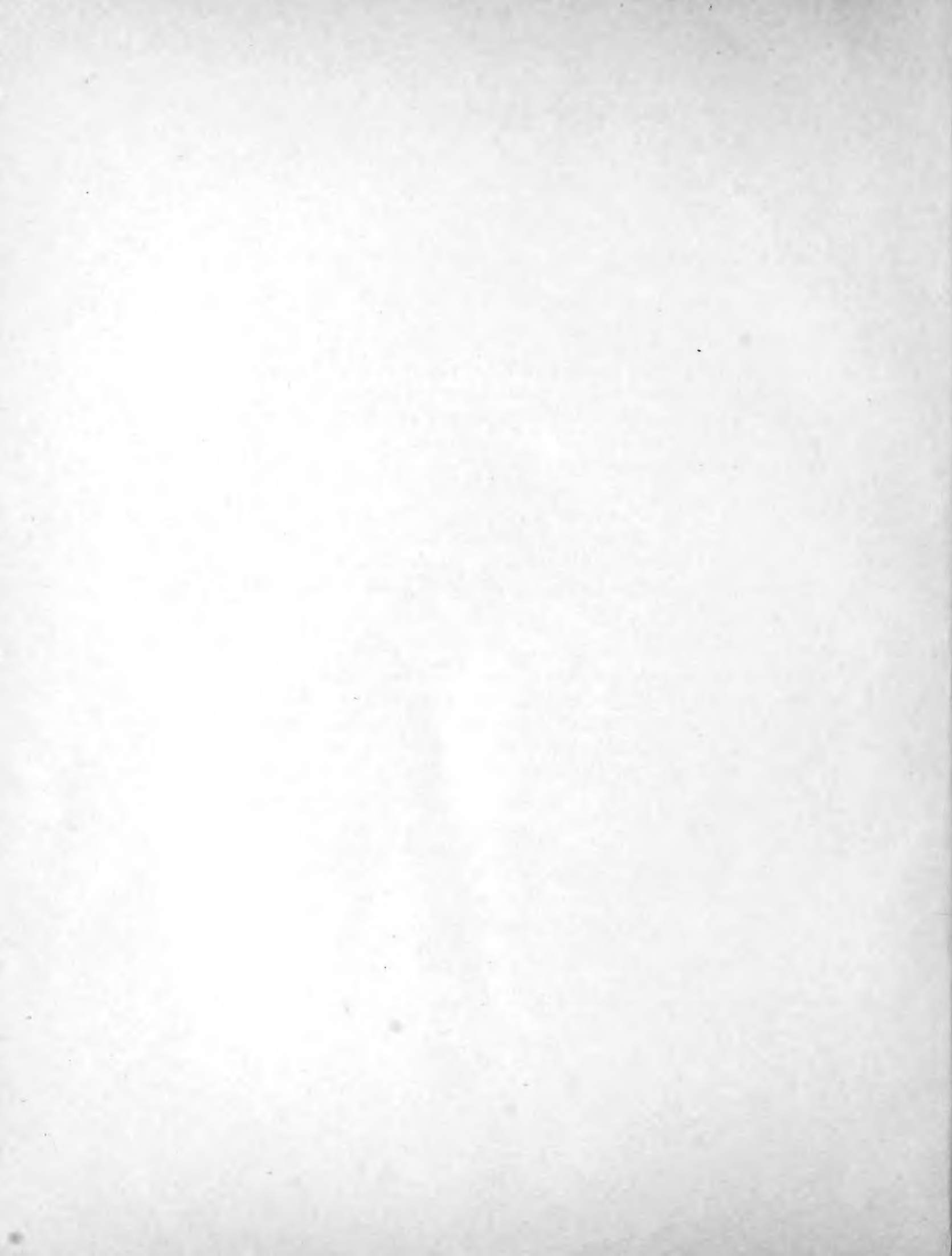
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25. MOENKHAUSIA LEPIDURA GRACILIMA Eigenmann.

Plate 101, fig. 7.

*Moenkhausia lepidurus gracilimus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 104 (Serpa); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

HABITAT.—Serpa.

20983 Cotypes      21      About 39-57 mm.      Serpa      Thayer

Anal on an average with twenty-two rays, there being one with nineteen, two with twenty, one with twenty-one, eleven with twenty-two, four with twenty-three, one each with twenty-four and twenty-five; pectoral not reaching ventrals.

Depth 4 or nearly 4, the greatest depth just behind pectorals, then tapering gradually to caudal. The fontanel, in the long, slender ones with a typically colored caudal, is narrower than in the others. Lateral line 35 or 36.

Color of caudal as in typical individuals of *M. lepidura*, but faint, with a dusky shade extending on the lower caudal lobe.

Humeral spot, even in the smallest, of over twenty chromatophores, not well defined.

20717      17      47-59 mm.      Villa Bella      Agassiz

These specimens are nearest those from Serpa. They have, on an average, twenty-two anal rays. Five have twenty-one, five twenty-two, and four twenty-three; the pectoral does not reach the ventrals. Depth 3-4; lateral line 35 or 36. Middle caudal rays and distal part of all the remaining rays as well as the upper and lower margin of the fin dusky; tip of anal lobe sometimes milk-white; humeral spot of many chromatophores, extending up from the second and third or third and fourth scales.

These specimens are appreciably different from typical *M. lepidura gracilima*, but gradations between them are almost perfect.

26. MOENKHAUSIA COLLETTII (Steindachner).

Plate 8, fig. 1; Plate 15, fig. 4; Plate 101, fig. 3.

*Tetragonopterus collettii* STEINDACHNER, Flussf. Südamer., 1882, 4, p. 33, pl. 7, fig. 3, (Obidos; Hyavary); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 81.

*Moenkhausia collettii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus., 1912, 5, p. 328.

HABITAT. — Amazons and Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20952	36	37-63	Jatuarana	Navez
20711, 20721	20	20-59	Villa Bella	Agassiz
20812	3	37-49	Iça	James
20840	3	31-40	?	?
20843	41	about 34-54	Obidos	Bentos
1324 C. 11804 I.	19	43-58	Wismar, Demerara River	Eigenmann
1326 C. 11807 I.	5	34-39	Malali, Demerara River	Shideler
1327 C. 11810 I.	136	40-61	Rockstone, Essequibo River	Eigenmann
1328 C. 11806 I.	12	37-59	Gluck Island at Rockstone	Eigenmann
1329 C. 11808 I.	5	41-56	Crab Falls, Essequibo River	Eigenmann
1330 C. 11803 I.	19	33-46	Konawaruk, Essequibo River	Eigenmann
1331 C. 11809 I.	41	35-66	Tumatumari, Potaro River	Eigenmann
1332 C. 11801 I.	100+	24-68	Erugin, tributary of Potaro River, below Amatuk	Eigenmann
1333 C.	1	63	Amatuk Cataract	Eigenmann
1334 C.	3	38-40	Tusaca Pan, Rupununi	Grant
3739 C.	111	largest 58	Bragança	Haseman
3740 C.	16	45-50	Bastos	Haseman
3741 C.	2	53-56	Manaos	Haseman
3742 C.	5	40-56	Maciel, Rio Guaporé	Haseman

Head 3.7-3.8; depth 2.6 in gravid females to 3.3 in males, 3.75 in some specimens from Guiana; D. 11 (rarely 10 or 12); A. usually 33 or 34<sup>1</sup>; scales 5-34<sup>2</sup>-3½; eye 2.5-2.75; interorbital about 3 in head.

Compressed, dorsal and ventral profiles equally curved, without humps or depressions; preventral area rounded; postventral area compressed or narrowly rounded; predorsal area keeled for at least half the distance from the dorsal to the occipital process; a median series of nine or ten predorsal scales extending from the dorsal to the occipital.

Occipital process extending about one fifth of the distance from its base to the dorsal, bordered by two or three scales; interorbital convex in the middle, with lateral grooves; frontal fontanel narrower and about three fourths as long as the parietal; second suborbital leaving a naked area on the cheek, widest

<sup>1</sup> Of the Amazon valley specimens one has nineteen anal rays, three have twenty, five twenty-one, six twenty-two, thirty-four, twenty-three, twenty-eight, twenty-four, eleven twenty-five, and five twenty-six. Of forty-one Guiana specimens three have twenty-one anal rays, sixteen twenty-two, sixteen twenty-three, and six twenty-four.

<sup>2</sup> Rarely 33 and 35.



below; maxillary equal to distance from tip of snout to pupil, three in the head. Usually four, sometimes five teeth in the outer row of the premaxillary, the second and third close together, the third withdrawn from the line; five teeth in the second series; maxillary with two or three minute teeth.

Four large teeth in the front of the lower jaw, minute ones on the sides.

Gill-rakers 7 + 10, about one third the diameter of the eye.

Scales closely imbricate, with several striae; caudal lobes scaled for rather more than half their length; anal with a sheath of a single series of scales in front; lateral line but little decurrent, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal usually nearer tip of snout than base of caudal, its height three and a half in the length, its highest ray nearly three times as high as its penultimate; caudal widely forked, the lobes longer than the height of the dorsal; anal emarginate, its highest ray reaching to base of last ray but five, its origin considerably behind the vertical from the last dorsal ray, its base about three and a half in the length; pectorals reaching ventrals, ventrals to or nearly to anal; origin of the ventrals equidistant from tip of snout and base of last anal ray.

No caudal spot; a very narrow silvery band overlying a dark line; a well-defined humeral spot of numerous chromatophores above the third, fourth, and fifth scales of the lateral line; numerous chromatophores on the upper half of the cheek and opercle; a dark line of varying intensity and width along the base of the anal; scales of the back margined with dusky; scales of the median line in front of and behind the dorsal dusky, or with a dusky margin and a dusky median spot. The color varies much in intensity with different localities. Those from Jatuarana, Villa Bella, Iça are pale, those from Obidos are dark. In life the vertical fins of the Guiana specimens at least are more or less tinged with red.

Anterior anal rays of the male with recurved hooklets.

Vertebrae 13 + 17.

Posterior air-bladder about equal to the eye in diameter, more than twice the length of the anterior bladder, about three times as long as the eye, blunt behind and bent down to near the origin of the anal. Alimentary canal about equal to the length without the caudal. Insect eaters.

There is considerable variation in shape in the Guiana specimens enumerated. The specimens from Rockstone are deep and thin, depth about 2.75; those from Konawaruk and the Potaro are more elongate and heavier. In the Konawaruk specimens the depth is 3.75.

27. *MOENKHAUSIA COPEI* (Steindachner).

Plate 9, fig. 3; Plate 101, fig. 4.

*Tetragonopterus copei* STEINDACHNER, Flussf. Südam., 1882, 4, p. 135, pl. 6, fig. 6. (Santarem); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53.

*Moenkhausia copei* EIGENMANN, Rept. Princeton univ. Exped. Patagonia, 1910, 3, p. 438; Mem. Carnegie mus., 1912, 5, p. 329.

HABITAT.—Santarem to Para and British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20783	30	34-44	Santarem	Bourget
21072	1	30 (to base of caudal)	Para	Thayer Expedition
1321 C. 11824 I.	26	30-56	Wismar, Demerara River	Eigenmann
1322 C. 11821 I.	11	33-56	Gluck Island at Rockstone	Eigenmann
1323 C. 11820 I.	53	27-55	Rockstone, Essequibo River	Eigenmann
1324 C. 11823 I.	42	35-45	Tusaca Pan, Rupununi	Grant
3742 C.	5	40-56	Maciél, Rio Guaporé	Haseman

Closely allied to *M. collettii*; distinguished by the shorter anal.

Head 3.66-4; depth 3.33-3.66; D. 11; A. 18-20<sup>1</sup>; scales 5-32 to 34-3.5 (usually 33 pores in the lateral line). Eye 2.5-2.75 in the head; interorbital 3 or a little more.

Slender, little elevated; dorsal and ventral profiles about equally curved, nowhere notably depressed or elevated; preventral area flattish; postventral area compressed; predorsal area obscurely keeled just in front of the dorsal, with a median series of nine scales reaching to the occipital process.

Occipital process short, less than one fifth the distance from its base to the dorsal, bordered by two or three scales on the side; interorbital convex in the center, with lateral grooves; frontal frontanel much narrower and about three fourths as long as the posterior; second suborbital leaving a naked border on the cheek which is widest below; maxillary equals distance from tip of snout to pupil; frequently four teeth in the outer row of the premaxillary, of which the middle two are close together and remote from the others; five teeth in the second row; one or two maxillary teeth; four large teeth in the front of the mandible.

<sup>1</sup> Out of fourteen four have eighteen anal rays, nine nineteen and one twenty.

Gill-rakers one fifth to two sevenths of the diameter of the orbit, about 7 + 12.

Scales closely imbricate, with few divergent striae; caudal lobes scaled for about half their length; anal with a sheath of a single row of scales in front; lateral line but little decurved, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal about equidistant from tip of snout and base of caudal, its height three and a half in the length; caudal deeply forked, the lobes about three in the length; anal deeply emarginate, its origin behind the vertical from the last dorsal ray; pectorals and ventrals about the same length, about equal to the length of the head without the snout; ventrals not to anal, tips of pectorals one or two scales from ventrals.

No caudal spot; a very narrow silvery band overlying a narrow dark band which in some specimens becomes wider in front, sometimes expanded into a humeral spot over the fourth scale of the lateral line, continued across the upper part of the opercle and preopercle to the eye; a black line along the base of the anal, expanded into a broader spot above the base and in front of the first anal rays; middle anal rays dark; scales of the back margined with dusky, scales of the median line in front of the dorsal dark.

The Rockstone specimens have the caudal rose colored in life, especially the upper lobe; those from Gluck Island have the adipose and upper caudal lobe rusty, anal lobe lemon-yellow, dorsal yellow in center, tinged with orange.

Vertebrae 12 + 17.

Posterior air-bladder long, banana-shaped; curved down behind to in front of the anal, its diameter but little less than that of the eye, its length at least twice that of the anterior air-bladder. Alimentary canal about equal to the length (without the caudal).

## 28. MOENKHAUSIA CEROS Eigenmann.

Plate 9, fig. 2; Plate 101, fig. 1.

*Moenkhausia ceros* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 104 (Lake Hymanuary); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

HABITAT.—Amazon Basin.



*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20955 Type	1	50	Lake Hyanuary	Navez
3725 C.	1	52	Manaos	Haseman
3726 C.	3	about 20-51	Bastos	Haseman

Distinguished by its caudal spot and short anal. Head 4; depth 3.25; D. 11; A. 18 or 19; scales 5-33 or 34-3. Eye 3, a little more than interorbital.

Elongate, compressed; dorsal and ventral profiles gently curved, dorsal profile somewhat angulated at the origin of the dorsal, not depressed over eyes. Preventral area flattish, with a median series of scales, the lateral scales somewhat angulated; predorsal area somewhat keeled, with a median series of ten scales reaching from the occipital process to the dorsal.

Occipital process short, reaching about one sixth to dorsal, bordered by three scales on each side; interorbital very slightly convex; second suborbital leaving a wide naked area; maxillary not reaching end of first suborbital, equal to distance from tip of snout to pupil, two and two thirds in the head.

Four teeth in the front series of the premaxillary, opposite the second and third of the inner series, the first distinctly largest; inner series of five or six graduated teeth; four large, graduated teeth on each ramus of the lower jaw and numerous small ones.

Gill-rakers about 9 + 15, long and slender, one half as long as eye.

Scales regularly imbricate, with four to six striae; two and a half scales between lateral line and front of anal, apparently no anal sheath; caudal lobes with scales for at least half their length; lateral line slightly decurved, the rows of scales above and below it parallel with it; a well-developed axillary scale.

Origin of dorsal about equidistant from tip of snout and base of caudal, the ventrals a little nearer tip of snout; highest dorsal ray not quite four in the length; anal emarginate, its origin but little more remote from the tip of the snout than the end of the dorsal, anal basis a little more than one fourth of the length; the adipose fin opposite the end of the anal. Ventrals reaching anal; pectorals to ventrals.

The middle of the first fully developed anal ray of the male provided with a large retrorse hook on each side.

A faint, ill-defined, silvery band, above which is a gray line; middle caudal rays jet black, the color spreading out over the base of the fin. Scales and fins minutely punctate; sides brassy iridescent. Humeral spot very faint or absent.

## 29. MOENKHAUSIA COTINHO Eigenmann.

Plate 9, fig. 1; Plate 101, fig. 2.

*Moenkhausia cotinho* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 104 (Para); Rept. Princeton univ. exped. Patagonia, 1910, 3, 434; Mem. Carnegie mus., 1912, 5, p. 327.

HABITAT.—Amazon Basin; Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
21013 Cotypes	2	46-54 (to base of caudal)	?	Justa
21070 Cotypes	3	67-71	Para	Thayer Expedition
3729 C.	3	53-55	Villa Bella	Haseman
3730 C.	2	52-55	Manaos	Haseman
3727 C.	1	52	Maciél, Rio Guaporé	Haseman
3728 C.	1	54	San Joaquin	Haseman
3747 C.	1	48	Santarem	Haseman
1312 C. 11813 I.	35	34-55	Wismar, Demerara River	Eigenmann
1313 C. 11814 I.	33	42-60	Malali, Demerara River	Shideler
1314 C. 11818 I.	22	52-62	Tukeit, Potaro River	Eigenmann
1315 C.	1	64	Cangaruma, Potaro River	Eigenmann
1316 C. 11815 I.	6	45-51	Mud flats below Wismar	Eigenmann
1317 C. 11812 I.	27	44-66	Tumatumari, Potaro River	Eigenmann
1318 C. 11819 I.	17	43-59	Crab Falls, Essequibo River	Eigenmann
1319 C. 11816 I.	7	41-57	Christianburg Canal	Eigenmann
1320 C. 11817 I.	2	35-57	Rockstone, Essequibo River	Eigenmann

Distinguished by its slender form combined with the broad basal caudal bar.

Head 3.7-4; depth 2.8-3.3; D. 11; A. 19-21. Scales 5-31 to 33-3.5. Eye 2.71-3. Interorbital slightly greater or less than eye.

Elongate, not strongly compressed or elevate; dorsal and ventral profiles equally curved, without notable depressions or elevations. Preventral area rounded or flat, with a median series of scales, bordered by scales not at all or but little angulated; postventral area compressed, with a median series of large, angulated scales; predorsal area rounded with a median series of nine scales from the dorsal to the occipital process.

Occipital process short, reaching one sixth the distance to dorsal, bordered by two or three scales on each side. Interorbital slightly convex; second sub-orbital greatly arched, leaving a very narrow naked area; maxillary two and

two thirds to three in the head; three or four teeth in the outer series of the premaxillary, five teeth in the second series; two teeth in the maxillary. Lower jaw with four large teeth followed by a much smaller recurved tooth and a number of minute teeth.

Gill-rakers  $7 + 9$ , very short, the longest about one fifth the diameter of the eye.

Scales very regularly imbricate, of comparatively uniform size, each with about five diverging striae, and with the surface minutely marked as in *M. oligolepis*. Caudal lobes scaled for at least half their length; scales above anal not decreased in size, at most four ( $3\frac{1}{2}$ ) scales between origin of anal and lateral line; anal with a basal sheath of a single series of scales in front, none posteriorly. A well-developed axillary scale.

Dorsal a little nearer base of middle caudal rays than tip of snout, highest dorsal ray three and a half or four in the length; ventrals nearer tip of snout than the dorsal, equidistant from tip of snout and base of lower caudal rays; origin of anal equidistant from tip of snout and the second or third scale behind the dorsal; ventrals scarcely or not reaching anal; pectorals to near ventrals. Anal emarginate.

Brassy, fins dusky. A very large and very conspicuous vertically oval black spot occupying all the base of the caudal (to near the tip of the middle rays), bordered behind, especially on the third, fourth, and fifth rays from the middle, by milk-white.<sup>1</sup>

The three cotypes from Para are much paler, the caudal spot while covering the same area is very faint except that part not covered by the caudal scales.

In all the specimens from the Amazon Basin the lateral line is complete. It is also complete in one hundred specimens from Wismar, Malali, Tukeit, and Cangaruma. The first two of these localities are on the Demerara River, the second two on the Potaro River of British Guiana. Out of six specimens from below Wismar one has the line interrupted.

In at least four out of six specimens from Christianburg, but one mile from Wismar, the lateral line is either interrupted or incomplete.

In the Rockstone specimens it is incomplete.

In the Crab Falls specimen the lateral line is developed on from ten to seventeen scales.

In five specimens from Konawaruk the lateral line is incomplete.

Out of the twenty-seven specimens from Tumatumari the lateral line is

<sup>1</sup> In living specimens from British Guiana this spot is surrounded by rusty.



complete on both sides of two specimens, two have it complete on one side and interrupted on the other. In a number of specimens it is incomplete on one side and interrupted on the other. In five it is interrupted on both sides. In the rest in so far as the specimens are fit for examination it is incomplete.

Lateral line of *Moenkhausia cotinho* from Tumatumari.

Scales with pores in italics.

Left	Right
1, <i>30</i>	<i>30</i>
2, <i>30</i>	<i>31</i>
3, <i>15 + 2 + 5 + 1 + 2 + 1 + 6</i>	<i>31</i>
4, <i>31</i>	<i>23 + 4 + 4</i>
5, <i>22 + 3 + 1 + 1 + 3</i>	<i>20 + 1 + 2 + 1 + 1 + 5 + 3</i>
6, <i>15 + 4 + 2 + 11</i>	<i>20 + 9 + 3</i>
7, <i>17 + 1 + 3 + 11</i>	<i>20 + 10 + 2</i>
8, <i>23 + 1 + 2 + 5</i>	<i>26 + 1 + 2 + 3</i>
9, <i>16 + 3 + 1 + 1 + 2 + 5 + 5</i>	<i>16 + 4 + 2 + 3 + 4 + 3 + 1</i>
10, <i>21 + 11</i>	<i>21 + 1 + 2 + 8</i>
11, <i>18 + 1 + 2 + 12</i>	<i>23 + 10</i>
12, <i>17 + 2 + 2 + 11</i>	<i>18 + 14</i>
13, <i>16 + 16</i>	<i>16 + 16</i>
14, <i>14 + 17</i>	<i>13 + 1 + 1 + 17</i>
15, <i>14 + 17</i>	<i>12 + 2 + 2 + 15</i>
16, <i>13 + 1 + 1 + 18</i>	<i>13 + 19</i>
17, <i>13 + 17</i>	<i>14 + 17</i>
18, <i>14 + 18</i>	<i>13 + 20</i>
19, <i>11 + 20</i>	<i>12 + 18</i>

A critical examination of the details given above shows a regular gradation from the completed lateral line of *Moenkhausia* at the top of the list to the incomplete line of *Hemigrammus* at the bottom.

In specimens numbered 3 and 4 in which the line is complete on one side several pores failed of development, not at the end of the line but at some distance from the end. In number 5 the line reaches the caudal on both sides but some pores are missing on both sides. In number 9 we find the same but the missing pores occur four scales further forward. In 6, 7, and 8 the line does not reach the caudal on one side and in all the rest it fails to reach the caudal on both sides. It becomes progressively shorter. Numbers 11, 12, 14, and 15 show that the shortening may take place by the dropping, not of the last pore but of some pores in advance of it.

In this series we see a regular progression without notable breaks from the condition which is considered to characterize one genus to the condition charac-

terizing another genus. This series should be compared with the series of *M. sanctae filomenae*.

To complete the record I add the conditions in the specimens from Konawaruk, Crab Falls, and Christianburg.

Konawaruk is a short distance up the Essequibo from the mouth of the Potaro River, Crab Falls is a still shorter distance below the mouth of the Potaro and Tumatumari a few miles above the mouth of the Potaro at its first cataract.

Lateral line of *Moenkhausia cotinho*.

A. Crab Falls		B. Konawaruk	
Left	Right	Left	Right
17 + 16	16 + 17	14 + 17	12 + 19
16 + 15	10 + ?	13 + 17 + 3	12 + 21
16 + 17	12 + 20	13 + 19	13 + 19
15 + 18	14 + 19	12 + 20	11 + 20
15 + 18	13 + 19	11 + 20	10 + 22
14 + 18	13 + 18		
14 + 19	16 + 16		
14 + 17	13 + 16		
13 + 19	12 + 20		
12 + 20	13 + 18		
12 + 20	12 + 21		
12 + 20	11 + 21		
12 + 20	?		
10 + 22	11 + 21		
		C. Christianburg	
		Left	Right
		15 + 10 + 3	10 + 21
		11 + 21	9 + 23
		? + 21	? + 22
		9 + 24	9 + 23

I have arranged the series from Crab Falls in regard to the pores in the line on the left sides. There is a regular gradation with an approximate but not complete correlation on the two sides of the body.



4. *KNODUS*, gen. nov.

*κνῦ*, a trifle, *δδους*, tooth.

TYPE.—*Bryconamericus breviceps* Eigenmann.

This genus differs from *Moenkhausia* as *Bryconamericus* differs from *Astyanax*.

Second suborbital expanded, in contact with the preopercle below; four teeth in the second row of the premaxillary; caudal scaled at its base; lateral line but little decurved.

HABITAT.—Tapajos, Tocantins, and Paraguay Rivers; Merida, Venezuela.

*Key to the Species.*

- a. Depth 3.5–4.24.
  - b. Dentary with a series of four large teeth, the series continued on the side by graduate teeth. Head 4.25; depth 3.75–4.25; eye 2.75 in head, equals interorbital; maxillary with 2 or 3 teeth; D. 10; A. 18–21, usually 19; scales 5–35 to 38–3; caudal entirely hyaline.
    - 1. *heteresthes* (Eigenmann).
  - bb. Dentary with eight graduate teeth. Head 4; depth 4; eye 3.25 in head; 1.25 in interorbital; maxillary with 3 teeth; D. 10; A. 16; scales 14–33–2. . . . . 2. *meridae* Eigenmann.
  - bb. Dentary with 3 or 3.5 large teeth followed by abruptly smaller teeth on the side; head 4; depth 3.5–3.75; eye 2.5–2.66, equals the interorbital; maxillary with 1–5 (usually 3) teeth; D. 10, A. 22–24; scales 5–39–3.5 or 4; middle caudal rays dark.
    - 3. *moenkhausii* (Eigenmann & Kennedy).
- aa. Depth 3 or less than 3 in the length; dentary with four large graduated teeth and a few smaller, similar ones on the side.
  - c. Head 4.5–4.66; depth 2.66–3; D. 10 or 11; A. 20–23; scales 5.5 or 6–38 to 41–4; eye 3–3.5; maxillary teeth 2 or 3. Caudal with numerous small scales.
    - 4. *breviceps* (Eigenmann).
  - cc. Head 4.25; depth 3 +; D. 10; A. 20; scales 4.5–36–3.5, eye 3; interorbital 2.8; maxillary with three broad teeth; caudal with large scales on the basal third.
    - 5. *victoriae* (Steindachner).
  - ccc. Head 3.75; depth 3; D. 10; A. 20; scales 6–42–4.5; eye 3; maxillary with three teeth.
    - 6. *chapadae* (Fowler).
  - cccc. Head 3.5; depth 3; D. 10; A. 27; scales 5–38–4; interorbital 2.2 in the head; maxillary without teeth. . . . . 7. *jacunda* (Fowler).
  - ccccc. Head 4; depth 2½; D. 9; A. 28; scales 6–39–4; interorbital 2.4 in the head; maxillary without teeth. . . . . 8. *smithi* (Fowler).

1. *KNODUS HETERESTHES* (Eigenmann).

Plate 10, fig. 4.

*Bryconamericus heteresthes* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 105 (Tapajos); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Tapajos.

Forty specimens, 20862 Cotypes      27–51 mm.      Tapajos      Dexter, James, Talisman

This is the most slender of the species of the genus.

Head 4.25; depth 3.75–4.24; D. 10 (counting everything). A. most often 19<sup>1</sup>, scales 5–35 to 38–3<sup>2</sup>; eye 2.75 in the head, equal to the interorbital.

Slender, elongated, very little compressed, the width being about half the depth; head blunt, the dorsal and ventral profiles equally arched, without depressions or humps; preventral area rounded; postventral area compressed, very narrowly rounded; predorsal area rounded, without trace of a keel, with a median series of 9–11 scales between the dorsal and occipital process.

Occipital process very short, about one eighth of the distance from its base to the dorsal, bordered by two scales on the sides; frontal fontanel less than one third as long as the parietal; interorbital flattish; second suborbital covering the entire cheek, leaving no naked portion; mouth small, the lower jaw included; maxillary short, equal to snout, three and three fourths in head; lower jaw equals diameter of eye. Four or five (rarely six) teeth in the front row of the premaxillary, the second tooth withdrawn from the line of the others, or the first pushed forward; four teeth in the inner series; maxillary with two or three teeth; mandible with four large teeth in front continued on the sides in a series of graduated teeth, the fifth tooth not notably smaller than the fourth tooth.

Gill-rakers about 5 + 9, very small, the longest one fifth of the diameter of the eye.

Scales deeply imbricate, without striae; anal sheath composed of a single series of small scales; caudal lobes scaled for at least one third of their length, the scales caducous. A well-developed axillary scale; lateral line very little decurved, the series of scales above and below it parallel with it.

Origin of dorsal equidistant from tip of snout and caudal; the highest ray one fifth of the length; adipose fin behind the vertical from the last anal ray; caudal lobes equal to the depth; anal origin behind the vertical from the last dorsal ray. Origin of ventrals equidistant from tip of snout and second scale in front of the dorsal or tip of last anal ray. Ventrals not reaching anal, the pectorals not reaching the ventrals.

Highly iridescent, silvery; a silvery lateral band two thirds as wide as eye, from humeral spot to caudal; a vertical humeral spot crossing the third and part of the fourth scale of the lateral line; a few pigment-cells on upper part of opercle and preopercle. Fins all hyaline, without chromatophores.

<sup>1</sup> In eleven of the largest, three have eighteen, five nineteen, two twenty, and one has twenty-one rays.

<sup>2</sup> Of ten one has 5.5 scales above the lateral line, and one has 3.5 below it; one has thirty-five, two thirty-six, four thirty-seven, and one thirty-eight pores in the lateral line.



Anterior anal rays of males with numerous recurved hooklets. Vertebrae 13 + 20; occipital process not extending back to the vertical from the posterior face of the skull.

Posterior air-bladder continued to the anal, its diameter two thirds that of the eye; its length one and a half times that of the anterior section; alimentary canal little longer than the entire fish.

## 2. *KNODUS MERIDAE* Eigenmann.

*Knodus meridae* EIGENMANN, Ann. mag. nat. hist., 1910, ser. 8, 7, p. 216 (Merida).

One specimen, 53 mm.      Merida, Venezuela      British Museum      P. M. Briceno

Head 4; depth 4; D. 10; A. 16; scales 4-33-2. Eye 3.25 in the head, about .8 in snout; 1.25 in the interorbital.

Basal half of caudal scaled. Slender; dorsal and ventral profiles scarcely arched.

Snout short, blunt; second suborbital covering the entire cheek, without a naked angle below its anterior corner; maxillary two in snout and eye; occipital process about one eighth the distance of its base from the dorsal.

Five teeth in the outer row of the premaxillary, the second retreated from the line of the rest; four teeth in the inner series of the premaxillary; maxillary with three broad multicuspid teeth; mandible with eight graduated teeth.

Two scales between the lateral line and anal; each scale of the sides with numerous diverging striae. Large scales on the base of the anal, scales on the base of the caudal lobes also large.

First dorsal a little nearer to the snout than to the base of the middle caudal rays, the highest ray a little more than five in the length; upper caudal lobe nearly five in the length, the lower slightly shorter; anal scarcely emarginate; ventrals reaching to anal, pectorals not quite to ventrals. A broad silvery band, tapering on the caudal peduncle, continued to the end of the middle caudal rays. No humeral or caudal spots.

3. *KNODUS MOENKHAUSII* (Eigenmann and Kennedy).

Plate 10, fig. 3.

*Poecilurichthys moenkhausii* EIGENMANN & KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 522 (Arroyo Trementina).*Bryconamericus moenkhausii* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Paraguay; Upper Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
10001 I.	1	} 29-43	Near Arroyo	} Anisits
10002 I. }	11		Trementina,	
10003 I. }			Paraguay	
20760	8 <sup>1</sup>	40-45	Tabatinga	Bourget

Head usually 4 (rarely 4.3); depth 3.5-3.75; D. 10, counting everything; A. 22-24; scales 5-39-3.5 or 4, rarely 38 scales in the lateral line; eye 2.5-2.66, equal to interorbital.

Slender, little compressed, the width about 2 in the depth; dorsal and ventral profiles equally curved, without elevations or depressions; preventral area rounded, postventral compressed; predorsal area narrowly rounded, without a keel, with a median series of (about 12) scales between the occipital process and the dorsal.

Occipital process about as broad as long, its length equals one eighth of the distance from its base to the dorsal, bordered on the side by one or two scales; interorbital flattish; frontal fontanel as wide as, and half as long as, the parietal; second suborbital covering the entire cheek to the lower opercular limb; maxillary slender, its anterior margin not conspicuously arched, its length not

<sup>1</sup>These eight have the following characters:

D.	A.	Scales	Head	Depth	Eye in the length of head	Mandible in the length of head	Teeth of the pre-maxillary	Teeth of the maxillary
10	22	5-38-?	4	3.5	2.66	3.5+	4 & 4	5
10	24	?	4.3	3.75			4 & 4	3
10	22	5-39-?	4	3.5	2.5	3+	4 & 4	3
10	22	5-39-3.5	4.3	3.75	2.5	3+	4 & 4	3
10	24	5-38-4	4.2	3.5	2.5	3+	5 & 4	1
10	22	5-39-3.5	4	3.6	2.6	3+	4 & 4	4
10	24	5-39-3.5	4	3.7	2.5	3+	5 & 4	1
10	23	?	4	3.5	2.6	3	4 & 4	3

much greater than the length of the snout, three and a half in the head; lower jaw two and three fourths in the head; uniformly four teeth in the inner series of the premaxillary, six of the specimens from Tabatinga with four, two with five in the outer series, the second and sometimes the third removed from the line of the first and fourth; lower jaw with only three or three and a half large teeth in front and several small ones on the sides; two of the maxillaries of the left side of specimens from Tabatinga with one, four with three, one with four and one with five teeth.

Gill-rakers about  $6 + 9$ , very minute, the longest about one seventh of the diameter of the eye.

Scales closely imbricate, with four to six diverging striae; a well-developed anal sheath of about two rows of scales; caudal lobes scaled for about one third their length, the scales caducous; lateral line slightly decurved, parallel with the row of scales below it.

Origin of dorsal equidistant from tip of snout and base of caudal, or slightly nearer the latter; origin of the ventrals nearer the tip of the snout by a space equal to or greater than the diameter of the eye, equidistant from tip of snout and base of last anal ray; highest dorsal ray one fifth of the length; anal emarginate, its origin equidistant from tip of snout and second third of dorsal; ventrals scarcely reaching to anal, pectorals usually not quite to origin of ventrals.

An ill-defined silvery lateral band or if dissolved a band of scattered chromatophores from the eye to the base of the caudal, the cells sometimes concentrated to form a vertical, humeral spot crossing the lateral line. Vertebrae  $13 + 23$ .

In the types of *K. moenkhausii* the caudal sheath of scales apparently is not as well developed as in the specimens from Tabatinga. The lateral color-band is less well developed. I am not able to make out other differences with the material at hand.

#### 4. *KNODUS BREVICEPS* (Eigenmann).

Plate 10, fig. 2.

*Bryconamericus breviceps* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 105 (Goyaz); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

HABITAT.—Amazon Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20692 Cotypes	24	about 65-87	Goyaz	Honorio
3748 C.	19	21-62	Villa Bella	Haseman
3749 C.		45-48	Alcoboca	Haseman
3750 C.		44	Rio Mamoré	Haseman

Distinguished by its short head, small fins. Head 4.5-4.66<sup>1</sup>; depth in males and spent females about 3, in females with eggs 2.66-2.8; D. 10-11; A. 20-23. Scales 5½ or 6-38 to 41-4 above ventrals or anal. Eye 3 (rarely more, to 3.5); interorbital equals eye.

Elongate, rather heavy; dorsal profile slightly depressed at the nape; ventral profile more strongly arched than the dorsal; preventral area rounded, postventral area more narrowly rounded; predorsal area rounded, with a median series of about twelve scales from the dorsal to within one scale of the occipital crest.

Occipital process very short, not reaching one ninth the distance from its base to the dorsal, bordered by two scales on the side; frontal fontanel very short; suborbital covering the entire cheek; snout pointed, maxillary not much longer than snout, three and three tenths in head; mandible two and a half in head. Four or five teeth in the front row of the premaxillary, the first further forward than the rest, the second and fourth, or second and third, sometimes withdrawn from the line; only four in the second row; two or three teeth on the maxillary; lower jaw with four graduated teeth and a few small similar ones on the side.

Gill-rakers very short, one fourth the diameter of the eye, 6 + 10.

Scales regularly imbricate, thin, adherent, with about six feeble striae; anal sheath of a single row of scales; caudal lobes, with minute scales for about

<sup>1</sup> Ten specimens selected at random, have the following

	D.	A.	Scales	Depth	Eye
♀ with eggs	10 = (9½)	21	5.5-38-4	2.66	3
♀ " "	10	21	6-41-4	2.66	3.3
♀ " "	11 = (10½)	21	6-39-4	2.8	3.2
♀ " "	10	22	5-40-4	2.75	3
♀ " "	10	20	5.5-39-4	2.66	3
♂	10	23	5.5-36-4	2.86	3.5
♀ spent	10	20	6-41-4	3.1	3
♂	10	23	5.5-39-4	3	3
♀	10	22	5.5-40-4	3.1	3
♂	10	20	6-41-4	3	3

half their length; a well-developed axillary scale; lateral line but feebly decurved, the rows of scales above it and below it parallel with it.

Origin of dorsal about equidistant from tip of snout and base of caudal; ventrals a little nearer snout, equidistant from tip of snout and end of anal, not nearly reaching anal in the types, to the anal in the rest; highest dorsal ray four or five in the length; origin of anal under the dorsal or behind the last dorsal ray; pectoral not reaching the ventrals.

A plumbeous lateral band on the row of scales above the lateral line, lost in front of the dorsal, becoming dusky behind and continued to the end of the middle caudal rays as a faint band; an inconspicuous vertical humeral spot just above the third and fourth scales of the lateral line, sometimes crossing these. Dorsal and anal dusky.

Vertebrae 14 + 22.

Air-bladder in a gravid female small, ending bluntly behind, not curved down, but ending at the beginning of the posterior wall of the abdominal cavity; posterior part a little more than one and a half times as long as the anterior section, its diameter not equal to that of the small eye.

Alimentary canal very little longer than the body; pyloric coeca very large, about seven. Stomach contained insect larvae.

##### 5. *KNODUS VICTORIAE* (Steindachner).

Plate 16, fig. 3.

*Tetragonopterus victoriae* STEINDACHNER, Anz. K. akad. wiss. Wien, 1907, **44**, p. 83 (Victoria on the Parnahyba).

One specimen, 3751 C.      53 mm.      Lagoa Parnagua, Jan. 17, 1908      Haseman

Head 4.25; depth 3+; D. 10; A. 20 (-22); scales 4.5-36 (to 38)-3.5; Eye 2.25-3; interorbital 2.8 in the head.

Elongate, not greatly compressed, the ventral profile a little more arched than the dorsal; preventral and predorsal areas rounded, the latter with twelve scales; occipital process very short, about one seventh of the distance between its base and the dorsal, bordered by two scales; interorbital rounded, a constriction between the fontanel. Cheeks entirely covered, maxillary shorter than eye; premaxillary with five teeth in the outer series of which the second and fourth are entirely withdrawn from the rest; four teeth in the inner series of the premaxillary; dentary with three large teeth, similar but much smaller ones on the side.



Dorsal rounded, its highest ray shorter than the head, its origin equidistant from snout and middle caudal rays. Caudal lobes longer than the head; origin of anal behind the vertical from the last dorsal ray; ventrals not reaching anal, their origin nearer base of last anal ray than snout; pectorals not reaching ventrals.

Scales very regular, with two or three striae; caudal with a few scales on the base of the lobes, extending further on the lower lobe than on the upper. Anal with a sheath of a single series of scales. Maxillary scale small.

Highly iridescent, a silvery lateral band; tip of dorsal hyaline, an oblique dusky streak through its middle. A dark spot on the base of the middle caudal rays, continued faintly to the tip of the middle rays and then obliquely across the lobes. A very faint humeral spot.

It is more than probable that the single specimen at hand is the *K. victoriae* described by Steindachner. His specimens have the silvery band bordered by dark above. A cherry-red spot at base of each caudal lobe in life.

#### 6. *KNODUS CHAPADAE* (Fowler).

##### Plate 10, fig. 1.

*Astyanax chapadae* FOWLER, Proc. Acad. nat. sci. Phil., 1907, p. 350, fig. 33 (Santa Anna da Chapada).  
*Bryconamericus chapadae* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 434.

21829 Paratype. Acad. Nat. Sci. Phil. 44 mm. to base of caudal. Santa Anna da Chapada, Matto Grosso, headwaters of the Paraguay. Known only from the types.

Very closely related to *K. breviceps*, but with much longer head. Like *K. breviceps* except in the characters noted below.

Head about 3.75; depth about 3; D. 10; A. 20; scales 6-42-4.5; eye 3, equals interorbital.

Elongate, without prominent elevations or depressions in the profiles, the median series of scales in front of the dorsal not quite complete, replaced by the overlapping scales of the two sides from the occipital process to about the fourth scale behind the occipital process.

Maxillary equals snout, three and a half in head; mandible two and four tenths. Five teeth (three on one side) in the front row of the premaxillary, the second is withdrawn from the line, three several pointed teeth on the maxillary; mandible with four large teeth and several small ones on the side.

Base of caudal scaled; ventrals rather nearer tip of last anal ray than to snout.

Dusky, a very faint humeral spot; middle caudal rays black; anal and a band from the middle of the anterior dorsal rays to the tips of the last six rays with numerous chromatophores.

#### 7. *KNODUS JACUNDA* (Fowler).

*Bryconamericus jacunda* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 555, fig. 17 (Madeira River, about 200 miles east of W. Long. 62° 20', Brazil).

This species is known from the type 31 mm. long in the collections of the Philadelphia Academy of Natural Sciences. The following description is condensed from Fowler.

Head 3.5; depth 3; D. 10; A. 26; scales 5-38-4; 12 predorsal scales; snout 4 in the head, eye 2.8, interorbital 2.2, maxillary 2.75, depth of caudal peduncle 2.5.

Five large, broad teeth in the inner series of the premaxillary. No maxillary teeth. Suborbital completely covering cheeks. No interpolated rows of scales; anal with a basal series of scales along its whole length.

Origin of dorsal equidistant from caudal and front of eye; ventrals extending past origin of anal, pectorals beyond base of ventrals.

A vertical humeral spot crosses the third to fifth scales of the lateral line; a faint lateral streak.

This is evidently a young specimen and may belong to *Moenkhausia*.

#### 8. *KNODUS SMITHI* (Fowler).

*Bryconamericus smithi* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 557, fig. 18 (Tributary of the Madeira River near Porto Velho, Brazil).

This species is known from six specimens 24-35 mm. long, in the collections of the Philadelphia Academy of Natural Sciences. The description is condensed from that of Fowler.

Head 3.66-4; depth 2.87-3.2; D. 9-10; A. 27-30; scales 6-36 to 39-4; 12-14 predorsal scales; snout 3.12-3.8 in the head, eye 2.2-2.75, interorbital 2.4-2.8, maxillary 2-2.8, depth of caudal peduncle 2.25.

Six five-pointed teeth in the premaxillary. No maxillary teeth. Su

orbital completely covering cheeks. No interpolated rows of teeth; anal with a basal series of scales along its whole length.

Origin of dorsal midway between snout and base of caudal; ventrals reaching anal, pectoral extending beyond base of ventrals.

A vertical humeral spot over fourth and fifth scales of the lateral line.

"Closely related to the preceding species, though apparently differs in the smaller head and deeper body" Fowler.

### 5. MARKIANA Eigenmann.

For Edward Laurens Mark.

*Markiana* EIGENMANN, Smithsonian misc. coll. quart., 1903, **45**, p. 145.

TYPE.—*Tetragonopterus nigripinnis* Perugia.

Related to *Moenkhausia* and *Gymnocorymbus*, from which it differs in the squamation and the abbreviated caudal; the scales are crenate, very regularly arranged, becoming gradually smaller below the lateral line, the series extending about halfway up on the anal.

Compressed, deep, with a regularly arched ventral outline, the dorsal regularity being interrupted at the nape, the profile concave over the eyes. Head short, broad; an occipital fontanel continued as a groove on the occipital crest, a frontal fontanel extending forward to middle of eye; mouth small, the small maxillary nearly vertical, scarcely reaching the eye, slightly slipping under the preorbital; cheeks covered by the suborbitals. No maxillary teeth; outer row of premaxillary with triangular cutting edge, scarcely notched; inner teeth very heavy, with a few points arranged in a crescent; three anterior teeth of the mandible heavy, the fourth much smaller. Gill-membranes free from isthmus, slightly united to each other; gill-rakers setiform, about twelve on the lower arch; dorsal over origin of anal; margin of anal convex; adipose well developed; lateral line nearly straight, near the middle of the body. Nares together; tongue fleshy, adnate.

HABITAT.—Guiana and La Plata.

### *Key to the Species.*

- a.* A dark caudal spot; pectorals dark, extending much beyond origin of ventrals; depth 2.33; head 3.4–4.5; A. 44; scales 7–38–7 to 10. . . . . 1. *nigripinnis* (Perugia).  
*aa.* No caudal spot; uniformly silvery; A. 40; scales 7.5–41–7 to the ventral. . . . . 2. *geayi* (Pellegrin).

## 1. MARKIANA NIGRIPINNIS (Perugia).

Plate 13, fig. 3-5.

*Tetragonopterus nigripinnis* PERUGIA, Ann. Mus. civ. storia nat. Genova, 1891, ser. 2a, 10, p. 643 (Rio de la Plata); 1897, ser. 2a, 18, p. 25 (Reyes; Rio Beni); EIGENMANN, Proc. U. S. N. M., 1893, 16, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 263, 273.

*Markiana nigripinnis* EIGENMANN, Smithsonian misc. coll. quart., 1903, 45, p. 145; Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

*Astyanax nigripinnis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 30 (Paraguay).

*Tetragonopterus anomalus* STEINDACHNER, Anz. K. akad. wiss. Wien, 1891, p. 173; Ichthyol. beitr., 1891, 15, p. 27; Sitzungs. K. akad. wiss. Wien, 1891, 100, p. 173, 369, pl. 3 (Rio Parana); EIGENMANN, Proc. U. S. N. M., 1893, 16, p. 53.

HABITAT.—La Plata Basin.

## 2. MARKIANA GEAYI (Pellegrin).

*Tetragonopterus (Markiana) geayi* PELLEGRIN, Bull. Mus. hist. nat., 1908, 14, p. 347 (Apuré).

*Markiana geayi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 438.

Known from a single specimen 104 mm. long, in the Jardin des Plantes.

## 6. GYMNOCORYMBUS Eigenmann.

γυμνός, naked; κόρυμβος, summit.

*Gymnocorymbus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 94.

TYPE.—*Gymnocorymbus thayeri* Eigenmann.

Very deep, compressed, Tetragonopterini form; anal long, its margin nearly straight, its origin behind the origin of the dorsal; mouth moderate, the maxillary reaching below eye; first and second suborbital leaving a moderate naked area all around its lower margin; scales all cycloid; lateral line complete, caudal and anal largely scaled; maxillary with one or two teeth; premaxillary with an outer series of tricuspid teeth and an inner series of many pointed teeth.

HABITAT.—Amazons and Paraguay.

## Key to the Species.

- a. Scales in lateral line 33-36; parietal fontanel arched over at base of occipital process; anal sheath of three or four series of scales; anal margin straight; anal and area above it not notably dark.
  - 1. *thayeri* Eigenmann.
- aa. Scales in lateral line 30-35; parietal fontanel not arched over; anal sheath of five or six series of scales; anal margin rounded; anal and area above it dark. . . . . 2. *ternetzi* (Boulenger).

## 1. GYMNOCORYMBUS THAYERI Eigenmann.

Plate 11, fig. 2.

*Gymnocorymbus thayeri* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 93 (Tabatinga to Gurupa); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
19242 type	1	40	Tabatinga	Bourget
20706	2	54	Teffé	Agassiz
19272, 20973	4	30-56	Cudajas	Thayer & Bourget
20804	1	70	Manacapuru	James
20807	9	50-77		
20998, 21065	20	40-50	Silva, Lake Saraca	Thayer
20984	29	38-57	Serpa	Thayer
20710, 20720	4	50-62	Villa Bella	Agassiz
20789	22	44-58	Santarem	Bourget
21007	8	45-55	José Fernandez	Cotinho
20724	2	65-72	Gurupa	Agassiz
21001	7	44-54	Jose Fernandez	Cotinho

Head 3.5 on an average; depth 1.7 on an average, ranging from 2.1 to 1.4; D. 11; A. 34-41<sup>1</sup>, most frequently 38 or 39; scales 7 to 8-33 to 36<sup>2</sup>-8 to ventrals; eye 2.25-3, 2.65 on an average; interorbital slightly less than the eye in the young, slightly more than the eye in the adult.

Very deep and very much compressed; the ventral profile much more arched than the dorsal, its deepest point at the origin of the anal; dorsal profile depressed over the eyes, humped in front of the dorsal; preventral area narrowly rounded in cross-section, postventral area more narrowly compressed; predorsal area narrowly rounded.

Occipital process one third or somewhat less the distance from its base to the dorsal; occipital fontanel continued to the tip of the occipital process as a groove, parietal portion sometimes partly arched over and demarked from the occipital groove; frontal fontanel about half the length of the occipital, its anterior end over the anterior margin of pupil; the profile beginning to

<sup>1</sup> Of sixteen counted one has thirty-four anal rays, two thirty-five, one thirty-six, one thirty-seven, four thirty-eight, five thirty-nine, one forty and one forty-one.

<sup>2</sup> Of twelve counted four have thirty-three anal rays, one thirty-four, five thirty-five and two thirty-six.



rise at the bridge between the fontanels at an angle of about  $45^{\circ}$  from the line joining tip of snout and middle of caudal. Interorbital convex, snout very short, mouth very oblique; second suborbital leaving a moderate naked area around its entire free margin; maxillary equals snout and eye in front of pupil; normally four teeth in the front row of the premaxillary, the third slightly removed from the line of the rest; five teeth in the inner series; maxillary with one broad or two narrow teeth; mandible with four or five large, graduate teeth and several smaller ones on the side.

Gill-rakers about  $10 + 15$ , slender, the longest nearly half the length of the eye.

Scales cycloid, regularly imbricate, mid-preventral series very small; occipital process bordered by about five scales on each side; caudal lobes scaled to near their tips; scales of the sides continued without break into the anal sheath, which is composed of three or four series of scales in front and reaches up one third of the anal base. Scales everywhere cycloid, with several (five to seven on a scale above the middle of the lateral line) diverging striae; an axillary scale. Lateral line very little decurved, parallel with the row of scales just below it.

Origin of dorsal equidistant from tip of snout and base of upper caudal rays; its margin very oblique, the highest ray three in the length; adipose well developed, its origin about over the sixth anal ray from the last; origin of anal equidistant from tip of snout, and the third scale behind the dorsal, in the young, with the middle of the dorsal in the adult; margin of anal nearly straight; ventrals very small, equidistant from tip of snout and base of one of the last few anal rays, a little nearer to the tip of the snout than the dorsal or equidistant with the latter, not quite reaching anal in the adult; pectorals long, their bases elevated, their tips reaching the third scale above and third or fifth behind the origin of the ventrals.

Color similar to that of *Tetragonopterus argenteus*, a dark humeral bar followed by a lighter area and this again by a bar less well marked than the first; the first humeral bar is most intense above the third, fourth, and fifth scales of the lateral line, is vertical and extends in some cases to just behind the axil of the pectoral; the second bar extends across the ninth, tenth, and eleventh scales of the lateral line from in front of the dorsal; the area between the bars just above the lateral line is bright silvery. Lower sides brassy; fins hyaline to uniform dusky.

Males with hooklets on the anal.

Vertebrae 11 + 19. Six ray-bearing interhaemals in front of the first fully developed haemal spine, five between it and the second.

Second air-bladder more or less boot-shaped, the "toe" and "leg" of the same length, the toe sharply bent down, its tip reaching about halfway between the spinal column and anal, its greatest diameter half the length of the head; anterior air-bladder equal to the length of the "leg" of the posterior.

Alimentary canal about equal to the length without the caudal.

## 2. GYMNOCORYMBUS TERNETZI (Boulenger).

### Plate 11, fig. 1.

*Tetragonopterus ternetzi* BOULENGER, Proc. Zool. soc. Lond., 1895, p. 528; Trans. Zool. soc. Lond., 1896, 14, p. 35, pl. 8, fig. 2 (Descalvados; Matto Grosso); Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 2 (Urucum).

*Gymnocorymbus ternetzi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 137.

HABITAT.—Paraguay and Guaporé Basins.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11435 I. Cotype	1	39 to base of caudal)	Descalvados	Ternetz
3294 C.	4	39-53	Arequa, Paraguay	Haseman
3295 C.	12	38-54	Jauru, Paraguay Basin	Haseman
3296 C.	1	37	San Joaquin, Guaporé Basin	Haseman

Very close to *G. thayeri*.

Head 3.25; depth 1.8; D. 11 or 12; A. 40-42; scales 8-30 to 35-8; eye 2.5 mm.; interorbital 2.5.

Parietal portion of the posterior fontanel not demarked from the groove on the occipital process; a single maxillary tooth.

Gill-rakers 9 + 14.

Anal sheath of five or six rows of scales covering half of the anal.

About ten striae on a scale above the middle of the lateral line.

Origin of dorsal equidistant from tip of snout and end of adipose fin or nearer caudal than snout; origin of anal and base of fourth dorsal ray equidistant from tip of snout; margin of anal rounded; origin of ventrals and fourth scale in front of dorsal equidistant from tip of snout, reaching anal.

The vertical bars more uniform in color throughout their height than in *G. thayeri*, separated by a wider interspace, the second bar largely behind origin of dorsal; anal and area above it, with the caudal peduncle dark; dorsal, dark.

## 7. THAYERIA Eigenmann.

In memory of Nathaniel Thayer.

*Thayeria* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 94.

TYPE.—*Thayeria obliqua* Eigenmann.

Small, elongate Tetragonopterids reaching a length of near 80 mm., distinguished from all others by the unequally lobed caudal. It is otherwise near Hemigrammus and Creatochanes. Caudal scaled, lateral line incomplete.

HABITAT.—Amazon Basin.

## THAYERIA OBLIQUA Eigenmann.

Plate 3, fig. 5; Plate 80, fig. 1, 2, 4, 6.

*Thayeria obliquus* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 94 (Obidos); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20841 Cotype	25	47-76	Obidos	Bentos
3712 C.	5	47-62	Bastos	Haseman
3710 C. }	4	52-62	Maciel, Rio Guaporé	Haseman
3711 C. }				

Head about equal to the depth, 2.6 (in young)–3 in the length; D.10.5–11; A. usually 16 or 17, rarely 15 or 18<sup>1</sup>; scales 5–11 + 18–3; eye in the smallest equals twice the length of the snout, 2.4 in head, slightly greater than the interorbital; in the adult 2.9 in head, equal to the interorbital.

Little compressed, elongate, but little deeper than the head at the occiput; profile gently and evenly convex to the tip of the occipital process.

Preventral and postventral areas rounded. Predorsal area rounded, with a median series of scales.

Occipital process short, its length about six in the distance from its base to the dorsal, bordered by three scales; nares close together, separated by a flap only; frontal fontanel about half as long as the parietal, triangular, the anterior angle sometimes rounded, above the anterior margin of the pupil;

<sup>1</sup> In a count I found one with fifteen anal rays, five with sixteen, six with seventeen, and two with eighteen.

parietal fontanel somewhat wider than the frontal, extending as a groove to the tip of the short occipital process; surface of bridge between the fontanels below the surface of the skull; interorbital slightly convex; cheeks nearly covered, the naked area between the second suborbital and the preopercle only about one fifth the width of the third preorbital; a notch between the first suborbital and preorbital, the maxillary slipping under the preorbital but not under the first suborbital; premaxillary-maxillary border angulated, the maxillary reaching but little beyond anterior border of eye.

Mouth and dentition as in *Tetragonopterus*; the lower jaw with four heavy teeth on each side, abruptly followed on the side by minute teeth; premaxillary with three or four teeth on the front series, one of which frequently drops out of line; five graduated, multicuspid incisors in the inner series; the tips of the cusps very unequal in height, arranged in a nearly straight line. Maxillary without teeth.

Gill-membranes free from the isthmus, gill-rakers  $7 + 15$ , slender, about one half as long as the filaments.

Scales with the margin slightly crenate, the exposed part of the scale with numerous slightly diverging striae; lateral line reaching to above ventrals; anal with a sheath; caudal partly scaled, ventrals with a slender axillary scale; lateral line scarcely decurved.

Fins with exception of caudal all small; the origin of the dorsal in the middle of the body, very little behind the ventrals; adipose fin over end of the small, emarginate anal. Pectoral about equal to head less opercle, not reaching to ventrals; ventrals a little nearer tip of snout than dorsal, slightly shorter than pectoral, not reaching anal; anus nearer ventrals than anal; anal emarginate, its highest (first and second divided) rays reaching at least to base of the last, sometimes to the tip of the last rays; last ray not reaching more than halfway to caudal; dorsal small, its height equals length of head less half the opercle; caudal large, forked at the middle, the lower lobe much the longer, equals distance from tip of snout to middle of pectoral.

Brassy; anterior anal lobe usually dusky; male with a black band from upper angle of gill-opening to base of middle caudal rays, then obliquely along the upper part of the lower caudal lobe; female with a similar band on the caudal; the band on the sides extending obliquely upward to the first row of scales below the origin of the dorsal which is the second row above the dark stripe of the male.

Posterior part of air-bladder about twice as long as the anterior, scarcely

reaching to above anal; alimentary canal about equal to the entire length of the fish; seven pyloric coeca. Intestine contains debris of minute insects and plant fibers.

Vertebrae 13 + 15.

### 8. PRISTELLA Eigenmann.

*πριστης* = a saw, i.e. the fully dentate maxillary.

*Pristella* EIGENMANN, Bull. M. C. Z., 1908, 52, p. 99.

TYPE.—*Holopristes riddlei* Meek.

This genus differs from *Hemigrammus* much as *Hemibrycon* differs from *Astyanax*.

Lateral line incomplete, caudal scaled for at least one third of its length; maxillary with teeth along nearly the entire anterior edge; gill-rakers long, setiform; gill-membranes free from each other and from the isthmus.

HABITAT.—Coasts of Guiana and Orinoco.

#### *Key to the Species.*

- a. Depth 2.3–2.75; A. 20–24; dorsal, anal, and very frequently ventral, each with a conspicuous black spot; no caudal spot. . . . . 1. *riddlei* (Meek).
- aa. Depth 3.5; A. 16–18; caudal with a spot on the base of its middle rays, other fins all plain. . . . . 2. *aubynei* Eigenmann.

### 1. PRISTELLA RIDDLEI (Meek).

#### Plate 13, fig. 2.

*Holopristes riddlei* MEEK, Proc. U. S. N. M., 1907, 33, p. 11 (Los Castillas).

*Pristella riddlei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie, mus., 1912, 5, p. 330, pl. 45, fig. 3.

HABITAT.—Guiana and Venezuela.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10896 Type	1	about 29	Los Castillas	Riddle
— Paratypes <sup>1</sup>	4	29–31	Los Castillas	Riddle
1317 C. 11798 I.	56	12–29	Wismar, Demerara River	Eigenmann
1308 C. 11800 I.	8	37–47	Georgetown Trenches	Eigenmann
1309 C. 11796 I.	233	26–45	Botanic Garden, Georgetown	Shideler
1310 C. 11799 I.	5		Christiansburg Canal	Eigenmann
1311 C. 11797 I.	3		Kumaka	Eigenmann

<sup>1</sup> Collection of Field Museum, Chicago.



Head 3.75-4; depth about 2.3-2.75; D. 11; A. 20-24; scales 5-32-3, 6-8 with pores; eye 2.64; snout 4.12; interorbital about 2.5 in the head.

Short, deep, especially in the female, not greatly compressed; ventral profile more regularly, and in the female more strongly arched than the dorsal profile; profile of head nearly straight, rising at the occipital process. Pre-ventral area broadly, the postventral more narrowly rounded; predorsal area keeled, with nine or ten scales.

Occipital process about one fifth of the distance from its base to the origin of the dorsal, bordered on the side by about three scales; head convex, the fontanels broadest at the base of the occipital process, tapering regularly to the tip of the process and to a point over the anterior margin of the eye; frontal fontanel about as long as the parietal without the groove; second suborbital covering the entire cheek or leaving a very narrow naked area at its middle, a wider one at its anterior and posterior ends; mouth very oblique, the premaxillary with a very short antero-posterior extent, the maxillary regularly convex in front, broader than the preorbital, about 3 teeth in the front row of the premaxillary, about 8 in the second. Those of the outer series incisors with parallel margins, with a prominent broad central lobe and two receding shoulders, the teeth becoming conical toward the sides; the posterior series pointed incisors, or three pointed incisors with the middle point much the longer. Maxillary with a few large teeth near its upper angle and minute conical teeth scattered along nearly the entire margin; lower jaw with a single series of teeth, imperfectly tricuspid, the points broad, not unlike those of the upper jaw, graduated, the lateral teeth minute, conical; snout and maxillary two and a fourth in head.

Gill-rakers  $8 + 12$ , a little over half the length of the eye.

Scales cycloid, very regularly imbricate, with numerous striae parallel with their convex margin and few divergent striae; anal sheath of a single series of scales along the base of the anterior rays; caudal scaled for about one third of its length.

Origin of dorsal and ventrals about equidistant from snout; pectorals reaching ventrals, ventrals to anal; anal emarginate.

A humeral spot over the third and fourth scales of the lateral line; no caudal spot; dorsal, anal, and ventrals each with a conspicuous, jet-black spot; dorsal spot not extending upon the last ray, and leaving base and tips of rays hyaline; anal spot covering the third and fourth fifths (from the base) of the rays forming the anterior lobe; ventral spot leaving the outer and inner rays and bases and tips of all the rays hyaline. Very brilliant in life,

translucent, the caudal bright red, upper parts tinged with red, basal part of dorsal and anal lobe below the black spots bright yellow, the distal parts milk-white.

## 2. *PRISTELLA AUBYNEI* Eigenmann.

Plate 13, fig. 1.

*Pristella aubynei* EIGENMANN, Ann. Carnegie mus., 1909, 6, p. 24 (Lama Stop-Off); Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437; Mem. Carnegie mus., 1912, 5, p. 330, pl. 45, fig. 4.

HABITAT.—Lamaha Basin, British Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1042 C. Type	1	50	Lama Stop-Off	Eigenmann
1043 C. 11735 I.	203	20-50	Lama Stop-Off	Eigenmann
1044 C. 11736 I.	50	28-46	Cane Grove Corner	Eigenmann
1045 C. 11737 I.	21	35-49	Maduni Stop-Off	Eigenmann

This species is very abundant in the canal from Cane Grove Corner to Maduni Creek Stop-Off, British Guiana.

This species is placed in the genus with *P. riddlei* because in the technical characters they agree. There is every probability that they are not immediately descended from the same ancestor.

Head 3.75; depth 3.5; D. 10; A. 16-18; scales 6-31 to 33-3 rarely 4; 7 to 9 pores in the lateral line; eye 2.33; interorbital 3.

Elongate, heavy forward; ventral profile curved more than the dorsal, which is nearly straight to the dorsal, not depressed over the eye; prefrontal area broad, rounded, postventral area keeled; predorsal area narrowly rounded.

Occipital process triangular, very short, equal to one sixth of the distance from its base to the dorsal. Fontanel widest at the base of the occipital process, anterior fontanel slightly shorter than the posterior, triangular, its anterior pointed end a little in advance of the middle of the eye. Second suborbital leaving a wide naked area below, a narrower one behind. Mouth oblique; maxillary slender, its anterior margin nearly straight; two and three fourths in the head; five teeth in the front series of the premaxillary of which the middle one is withdrawn from the line of the rest. Inner series of teeth large, multicuspoid, graduate. Maxillary with numerous similar teeth; lower jaw with four or five graduate, multicuspoid teeth in front and minute ones on the side.

Gill-rakers about 6 + 11.

Scales thin, not conspicuously regularly imbricate; each scale with several nearly parallel horizontal striae; anal sheath composed of a single row of scales along the front of the fin; caudal lobes scaled for about one eighth of their length.

Origin of ventrals a little nearer tip of last anal ray than snout, slightly in advance of the dorsal; penultimate dorsal ray more than half the length of the longest which is three and three fourths in the length. Anal emarginate, ventrals reaching anal; pectorals not to ventrals.

In life, base of upper caudal lobe red, base of lower caudal lobe yellow, some yellow on under side of caudal peduncle and in front of anal. A circular spot about as large as eye on base of middle caudal rays. A dark line in front of dorsal, a series of spots behind it. A well-defined humeral spot on and over the second and third scales of the lateral line.

#### HEMIGRAMMUS GILL AND HYPHESSOBRYCON DURBIN.<sup>1</sup>

Compressed, rarely subcylindrical. Greatest depth on or near the vertical from the first dorsal ray. Postventral region narrow. Maxillary not slipping under the preorbitals. Lower jaw included, when the mouth is closed, but usually projecting beyond the snout when the mouth is open. Premaxillary teeth in two rows, the outer row more or less incomplete. All teeth conical or flat or fan-shaped, with 3-7 cusps, usually graduated from the enlarged median cusp.

Scales cycloid, regularly imbricate, striae few and variable in number. No interpolated scales or rows of scales. Anal sheath short, of a single, usually incomplete series of small scales. Lateral line somewhat decurved to nearly straight, the series of scales just below it parallel to it. Pores developed on the first three to eighteen scales.

The genus *Hemigrammus* was placed in the synonymy of *Astyanax* (*Tetragonopterus*) by Ulrey because Lütken had shown that in some supposed specimens of *T. fasciatus* the lateral line is complete, in others not. Two other species, *T. iheringii* and *T. oerstedii* are given by Ulrey as possessing these intermediate characters. But in the description of *T. oerstedii* it is specifically stated that the lateral line is complete, not interrupted. Also all the specimens of *T. iheringii* so far secured have a complete lateral line. This left *T.*

<sup>1</sup> The account of these genera has been worked up from my original manuscript by Mrs. Marion Durbin Ellis (Miss Marion Lee Durbin). She has devoted so much labor and care to these genera that she alone should be credited with the authorship.

*fasciatus* as an intermediate species. Lütken separated the species with an incomplete lateral line as a variety, *T. interrupta*. Upon reëxamining Lütken's specimens Eigenmann pronounces *T. fasciatus* and *T. interrupta* as being unquestionably distinct, differing in several characters besides the completeness or incompleteness of the lateral line.

During the examination of the very large series of specimens enumerated in the present work I found a complete lateral line in several species. Thus, among one hundred and two specimens of *Hemigrammus levis* from Lago do Maximo one had a complete lateral line. In over one hundred from other places the lateral line is incomplete. Of nineteen hundred and seventy-seven specimens of *Hyphessobrycon gracilis* from Brazil four have the lateral line complete. Of five specimens of *H. inconstans* two have the lateral line complete. Of nearly fifteen hundred specimens of *H. lütkeni* four have the lateral line complete and several others have it interrupted. Of one hundred and five specimens of *H. inconstans* from Quibdo, eighteen have a complete lateral line, eleven have it complete on one side and not on the other, and seventy-six have it incomplete on both sides.

*Hyphessobrycon* is separated from *Hemigrammus* by the single character, the scaled or naked condition of the caudal. Three out of the present fifty-four species of the two genera seem to be intermediate in regard to this character. Thus, *Hemigrammus elegans* has but few scales on the caudal and is put with *Hemigrammus* because it lacks the enlarged scale at the base of each caudal lobe which is characteristic of *Hyphessobrycon*. *H. analis* usually has only four or five scales on the caudal, but like *H. elegans* it lacks the enlarged basal scales and is placed with *Hemigrammus*. *H. stictus* usually has the basal scale and is, therefore, put with *Hyphessobrycon*, although it sometimes has a number of small scales actually on the base of the caudal lobes.

A question as to the validity of the species of these genera has been raised on the ground that these small fishes are immature, the young of other species. Accordingly dissections were made wherever sufficient specimens were at hand. One or more specimens were dissected of each of thirty-two species, and ovaries with large, in several cases apparently ripe, eggs were found in so many species that there is no room to doubt that, in most cases at least, we are dealing with mature specimens. The following table contains the result of the dissections in detail:

<i>Species</i>	<i>Number dissected</i>	<i>Result of the dissection</i>
<i>Hemigrammus ulreyi</i>	2	eggs present, but small
<i>coeruleus</i>	1	“ “ well developed
<i>unilineatus</i>	1	“ “ “
<i>marginatus</i>	1	“ “ “
<i>erythrozonus</i>	1	“ “ ripe, large and yellow
<i>levis</i>	3	“ “ ripe, “ “ “
<i>hyanuary</i>	1	“ “ large, ovary broken up
<i>brevis</i>	1	“ “ not large
<i>rodwayi</i>	1	“ “ large and ripe
<i>ocellifer</i>	1	“ “ well developed
<i>microstomus</i>	2	“ white and scattered in body cavity, comparatively few
<i>cylindricus</i>	1	“ present but not large
<i>analís</i>	2	male specimens.
<i>cupreus</i>	1	eggs large and evidently ripe
<i>Hyphessobrycon callistus</i>	1	eggs large and evidently ripe
<i>serpae</i>	1	specimen poorly preserved inside
<i>copelandi</i>	2	“ “ “ “
<i>bentosi</i>	2	“ “ “ “
<i>rosaceus</i>	1	eggs large and evidently about ripe
<i>panamensis</i>	1	specimen a male
<i>gracilis</i>	4	eggs fairly well developed
<i>taurocephalus</i>	1	eggs large, well developed
<i>parvellus</i>	1	“ “ “
<i>minimus</i>	1	no eggs, sex uncertain
<i>eos</i>	1	eggs large and very evidently ripe
<i>santae</i>	4	no eggs
<i>anasitsi</i>	1	eggs large, evidently ripe
<i>lütkeni</i>	1	eggs of unequal size, some large and full of yellow oil
<i>reticulatus</i>	1	eggs unequally developed, some quite large and ripe
<i>duragenys</i>	2	no eggs
<i>stictus</i>	1	eggs large, evidently ripe
<i>bifasciatus</i>	1	eggs large, evidently ripe

It seems quite certain that these genera are of polyphyletic origin, that several sections have been and are arising independently from *Astyanax* and *Moenkhausia* and probably other genera. These genera are conveniences rather than entities.

#### 9. HEMIGRAMMUS Gill.

ἡμι = half, γραμμή = a line.

*Hemigrammus* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 420.

TYPE.—*Poecilurichthys (Hemigrammus) unilineatus* Gill.

Minute or small; premaxillary teeth in two rows; the maxillary teeth wanting or reduced in number and restricted to the upper part of its free margin; scales in the lateral line 29–36; lateral line incomplete. Caudal scaled.

HABITAT.—Orinoco, Essequibo south to Paraguay, Rio das Velhas, and Rio Grande do Sul.

*Key to the Species.*

- a. Dorsal with a well-defined black spot.
  - b. Anal unmarked, a black line along its base. Dorsal black, with a wide white stripe from the tip of the first rays to the base of the last. Humeral spot horizontally elongate, continued as a black line to the caudal. Second suborbital leaving a wide naked margin behind and below. Maxillary with two or three conical or tricuspid teeth. D. 11, A. 23 to 25; scales 5 or 6–30 to 33–3.5.....1. *ulreyi* (Boulenger).
  - bb. Anal with black on the rays.
    - c. An iridescent blue line one scale wide extending from the base of the pectoral to the scale above the last anal ray; a wide light lateral stripe from the upper part of the eye to above the middle of the base of the caudal, interrupted or not by the vertically elongate humeral spot. Ventrals and anal lobe with a submarginal dark band. Second suborbital leaving a narrow naked margin. Maxillary with four or five, sometimes two or three, tricuspid teeth. D. 11; A. 20 to 22; scales 5–31 or 32–3.5.....2. *coeruleus* Durbin.
    - cc. Anal with an intense black bar from a little in front of the base of the first ray to the tips of the fourth and fifth rays. Humeral spot vertically elongate, often faint and sometimes lacking. Second suborbital leaving a narrow naked area below. Six small, tricuspid and conical teeth in the maxillary. D. 11, A. 23 to 27; scales 5–32 to 34–3 to 4.5.
      - 3. *unilineatus* (Gill).
      - 4. *elegans* (Steindachner).
- aa. Dorsal without well-defined black markings (see also *elegans*).
  - d. No humeral or caudal spot.
    - e. A wide lateral streak from the middle of the caudal to the head and another narrower streak from above the anterior anal rays to the mandible without black chromatophores; the sides and back everywhere else dusky. Anal lobe and distal half of dorsal lobe dusky. Second suborbital about one half as wide as the eye; without naked margins. Maxillary 1.33 in the eye, with two to four, 3- to 5-pointed teeth. D. 11; A. 20 to 22; scales 5–31 to 34–3 to 3.5. ....5. *erythrozonus* Durbin.
    - ee. Lateral stripe leaden, caudal lobes crossed by a broad, black marginal or submarginal band. Maxillary slender, about equal to the eye. D. 11; A. 20 to 24; scales 5–29 to 34–3 or 4. ....6. *marginatus* Ellis.
  - dd. No humeral spot, caudal spot usually developed, (see also *marginatus*).
    - f. Maxillary without teeth.
      - g. Premaxillary teeth tricuspid or conical. Maxillary much shorter than the eye. D. 11; A. 17 to 19; scales 3.5–30 to 32–2.5 to 3. ....7. *nanus* (Lütken).
      - gg. Premaxillary teeth 5- to 7- and 9-pointed. Maxillary equal to the eye. D. 11; A. 17 to 20; scales 5–30 to 34–3.5. ....8. *levis* Durbin.
    - ff. Maxillary with teeth.
      - h. An unpigmented area between the caudal spot and the lateral stripe; caudal spot not continued forward on the caudal peduncle. Premaxillary teeth with 5 to 7 cusps. Second suborbital two thirds the eye in width. Depth 3.2. Maxillary with one 7-pointed tooth. D. 11; A. 24; scales 4–32–4.
        - 9. *micropterus* Meek.
      - hh. Caudal spot continued forward on the caudal peduncle; more or less continuous with the lateral stripe.



- i. A silvery area on the upper half of the caudal peduncle. Anal lobe dusky, lateral stripe and caudal spot very evidently continuous.
- j. Depth 3.6 to 3.8. Second suborbital about half the eye in width, leaving a naked margin behind and below. Maxillary with one or two narrow 4-pointed teeth. D. 11; A. 14 or 15; scales 5-32 or 33-3. 10. *hyanuary* Durbin.
- jj. Depth 3. Second suborbital about three fourths the eye in width, in contact with the preopercle. Maxillary with three, 3-5 pointed teeth. D. 11, A. 23, scales 5-32 to 34-3. 11. *matei* Eigenmann.
- ii. No silvery area on caudal peduncle; caudal spot and lateral stripe only dimly connected. Second suborbital in contact with the preopercle.
  - k. Caudal peduncle slender, its depth 1.5 in the distance from the base of the middle caudal rays to the base of the last anal ray. Caudal spot not as wide as the caudal peduncle, on the middle caudal ray and not continued forward to the vertical from the adipose. Head 4; depth 2.7 to 3. Maxillary with two to four, conical or tricuspid teeth. D. 11, A. 22-24; scales 5-32 to 34-2 to 3.5. 12. *rodwayi* Durbin.
  - kk. Caudal peduncle deep, its depth equal to the distance from the base of the middle caudal rays to the base of the last anal ray. Caudal spot on the caudal peduncle, extending backward to the tips of the middle caudal rays, and forward to a vertical from one of the last five anal rays. Head 3.5; depth 2.6. Maxillary with two or three 3- to 5-pointed teeth. D. 11; A. 20 to 22; scales 5-29 to 33-3 or 4. 13. *brevis* Ellis.
  - kkk. Caudal spot intense, continued backwards along the middle caudal rays and along the edge of each caudal lobe. Anal falcate. Head 3.4. Maxillary with two 5-pointed teeth. D. 11; A. 16-19; scales probably 4 or 5-30 to 35-3. 14. *tridens* Eigenmann.
- ddd. Humeral and caudal spots both developed.
  - l. Dorsal equidistant from base of middle caudal rays and tip of snout, or nearer the caudal.
  - m. Origin of the dorsal equidistant from front of eye and caudal. Origin of the anal on the vertical from the last dorsal ray. Second suborbital leaving very narrow naked margins below and behind. Humeral spot distinct, vertically elongate, surrounded by a bright area, often with a second elongated spot behind the bright area. An iridescent spot on the upper half of the caudal peduncle. Caudal spot often continued along the edge of each caudal lobe. Maxillary with two or three, conical or tricuspid teeth. Depth 2.5; D. 11; A. 22 to 26; scales 5-30 to 33-3 to 3.5. 15. *ocellifer* (Steindachner).
  - mm. Origin of dorsal half the length of the head nearer the caudal than the snout. Origin of the anal on the vertical from the first or second dorsal rays. No bright area around the vertically elongate humeral spot. Second suborbital in contact with the preopercle. Maxillary with one tricuspid tooth. D. 11; A. 22; scales 5-30-3. 16. *boulengeri* Eigenmann.
  - mmm. Origin of dorsal slightly nearer middle caudal rays than tip of snout. Origin of anal on the vertical from the first to third scale behind the dorsal. Caudal spot wider than long, not continued backwards on the caudal peduncle. Humeral spot small. Maxillary with two, 4- or 5-pointed teeth. Second suborbital leaving narrow naked margins below and behind. D. 11; A. 15-17; scales 5-30-3. 17. *iota* Durbin.
  - mmmm. Origin of dorsal equidistant from snout and base of middle caudal rays; origin of anal under dorsal; caudal spot not continued on the caudal; maxillary with four or five 6-pointed teeth; third suborbital in contact with the preopercle behind. D. 11; A. 24-25; lateral line 33-35. 18. *barrigonae* Eigenmann.
- ll. Origin of dorsal nearer snout than base of middle caudal rays. Humeral

- spot small and indistinct. Maxillary with two or three small conical or tricuspid teeth. Depth 3; D. 11; A. 20-23; scales 5-30 to 34-3 to 3.5.....19. *schmardae* (Steindachner).
- ddd. Humeral spot present; no caudal spot, (humeral spot sometimes faint or lacking).
- n. Anal rays 19-26.
- o. Compressed, humeral spot often very faint.
- p. Middle teeth of the inner row of the premaxillary 5- to 7-pointed; outer caudal rays unmarked. Frontal fontanel almost equal to the parietal.
- q. Depth 2.75. Humeral spot very faint, horizontally elongate. Second suborbital sometimes in contact with the preopercle below. Maxillary three fourths of the eye, with two or three small conical or tricuspid teeth. D. 11; A. 23 to 26; scales 5-33 to 34-3.5...20. *lunatus* Durbin.
- qq. Depth 2.8-3.5. Humeral spot faint sometimes vertically elongate. Second suborbital leaving narrow naked margins behind and below. Mouth very small. Maxillary little more than one half the eye, with two or three 4- to 7-pointed teeth. D. 11; A. 19 to 22; scales 5-31 to 34-3. 21. *microstomus* Durbin.
- qqq. Depth 3.75. Humeral spot faint or diffuse, roundish. Second suborbital leaving narrow naked margins behind and below. Mouth moderately large. Maxillary equal to eye. First seven anal rays dusky. D. 11; A. 19-22; scales 5-30 to 33-3. Caudal not deeply scaled, 3 to 5 scales on each lobe.....22. *orthus* Durbin.
- pp. The inner row of the premaxillary with five to seven narrow 3-pointed teeth. Sides of caudal lobes often edged with a narrow dusky line. Humeral spot faint, vertically elongate, behind the upper margin of the eye. Eye 2.9 in the head. Frontal fontanel small, one half the length of the parietal. Second suborbital leaving narrow naked margins behind and below. Maxillary with three to five conical or tricuspid teeth. D. 11; A. 20-22; scales 5 to 7-30 to 33-3 or 3.25. 23. *cupreus* Durbin.
- oo. Subcylindrical, eye a little longer than broad, 2.25 in the head, snout comparatively long, 3.25 in the head. Maxillary nearly straight, with three to six tricuspid or conical teeth. Humeral spot small and intense. D. 11; A. 17-20; scales 5-30 to 34-3. 24. *cylindricus* Durbin.
- nn. Anal rays 12 to 14. Depth 3.2 to 3.5. Humeral spot diffuse. A wide silvery lateral stripe. Each dorsal scale marked with an intense dark spot. Second suborbital leaving considerable naked margins behind and below. Maxillary with two or three 6- to 7-pointed teeth. D. 11; A. 12-14; scales 5-30 to 32-3. 25. *analís* Durbin.

# 1. HEMIGRAMMUS ULREYI (Boulenger).

Plate 17, fig. 1; Plate 78, fig. 9, 10.

- Tetragonopterus ulreyi* BOULENGER, Proc. Zool. soc. Lond., 1895, p. 529; Trans. Zool. soc. Lond., 1896, 14, p. 35, pl. 8, fig. 3 (Descalvados); Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 3 (Urucum); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 126 (Corumba).
- Hemigrammus ulreyi* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 13; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 435; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Petas, Bolivia; Caceres; Jauru; Rio Santa Rita).

HABITAT.—Paraguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11434 I. Cotype	1	33	Matto Grosso	
10162 I.	1	37	Corumba	Anisits
3048 C.	1	39	Near Petas, Bolivia	Haseman
3049 C.	4	38-41	Caceres	Haseman
3050 C.	16	35-44	Jauru	Haseman
3051 C.	4	38-43	Rio Santa Rita	Haseman

Head 3.25 to 3.5, depth 2.5 to 2.75; D. 10; A. 23-25; scales 5 or 6-30 to 33-3.5; eye 2 to 2.5 in the head, interorbital 3.

Compressed depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region flat, with sometimes a complete series of 11 scales. Predorsal region rounded having a regular median series of 9 scales.

Occipital process 4 in the distance between its base and the dorsal, bordered by three scales. Interorbital almost flat. Frontal fontanel triangular, narrower than and nine tenths as long as the parietals without the occipital groove. Second suborbital bordered behind and below by a naked margin, one half to one third of its own width. Mouth moderately large. Maxillary shorter than the eye, a little less than 3 in the head. Mandible heavy, equal to the eye. Premaxillary with five or six, 4- and 3-pointed teeth in the inner row, and three or four tricuspid ones in the outer row. Maxillary with two or three conical or tricuspid teeth. Dentary with a graduated series of four large, 3- to 5-pointed teeth, and a series of eight to twelve minute, conical ones on the side.

Gill-rakers 7 + 13.

Anal sheath short, consisting of 2 or 3 scales and covering the bases of the first four or five rays. Lateral line with pores on eight to ten scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray 2.5 in the longest, which is about one fourth of the length. Origin of the anal on the vertical from the last dorsal ray. Anal falcate. Ventrals on the vertical from the third scale in front of the dorsal. Ventrals just reaching the anal; pectorals just reaching the ventrals.

Dorsal with a triangular black spot having the first ray for its base and the base of the fourth ray for its apex, the fin from the second to the eighth ray margined with black; the last two rays with scattered chromatophores. Humeral spot narrow, horizontally elongate, and enlarged posteriorly not quite connected with the black lateral stripe. No caudal spot. Somewhat silvery

below the lateral stripe and on the cheeks. Anal and caudal dusky, a black stripe along the base of anal.

11434 I. U. from Matto Grosso, British Museum have all of these markings intense black, while in 10162 I. U. from Corumba they are exceedingly faint.

## 2. HEMIGRAMMUS COERULEUS Durbin.

### Plate 17, fig. 2.

*Hemigrammus coeruleus* DURBIN, Bull. M. C. Z., 1908, **52**, p. 99 (Manacapuru); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Manaos).

HABITAT.—Amazon.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20801 Type	1	46	Manacapuru	James
20801 Paratypes	102	42-52	Manacapuru	James
3052 C.	3	49-58	Manaos	Haseman

Head 3.5; depth 2.75; D. 11; A. 20-22; scales 5-31 to 32; eye 2.5 to 2.7 in the head; interorbital equal to the eye.

Compressed; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region slightly rounded, median series of scales somewhat irregular, a broad scale occupying the whole space between the bases of the ventrals. Predorsal region broadly rounded with a complete median series of nine scales.

Occipital process one eighth of the distance from its base to the dorsal, bordered by one and one half or two scales. Interorbital very slightly convex. Frontal fontanel triangular just half as long as the parietal without the occipital groove. Second suborbital leaving a narrow naked area behind and a slightly wider one below. Maxillary very slightly longer than the eye. Mandible two in the head. Snout short, mouth large. Premaxillary with five, 5-pointed teeth in the inner row; and four or five less frequently two, conical or tricuspid teeth in the outer row. Maxillary with four or five sometimes two or three, tricuspid teeth. Dentary with four large teeth, a smaller one, and four or five minute conical ones on the sides.

Gill-rakers 8 + 10.

Caudal scaled halfway to the tips of the longest rays. Anal sheath consisting of about five scales and covering the base of the first ten rays. Lateral line with pores on the seven or eight scales.

Origin of the dorsal the length of the eye farther from the snout than from the base of the caudal. The penultimate ray slightly more than half the length of the longest, which is about four and a half in the length. Caudal equal to the length of the head. Origin of anal on the vertical from the last dorsal ray or a little behind it. Anal broad, emarginate, the longest rays reaching the base of the last ray. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals barely reaching the anal. Pectorals just reaching the ventrals.

Distal two thirds to three fourths of dorsal black or blackish, the color more intense in males; a submarginal bar on the anal lobe, and the proximal half of the ventrals, black, the rest of the anal rays often tipped with black. No caudal spot. Humeral spot vertically elongate, a bright area in front and behind it. A wide light lateral stripe from the upper part of the eye to above the middle of the base of the caudal, paralleled below by a less distinct, brown stripe. A bright iridescent blue streak from the pectoral to the scale above the last anal ray. The scales of the sides below the lateral stripe, except those bearing the blue stripe, with a greenish iridescence. Scales of the back and sides above the lateral stripe deeply outlined with dusky.



### 3. HEMIGRAMMUS UNILINEATUS (Gill).

Plate 21, fig. 5; Plate 78, fig. 8.

- Poecilurichthys Hemigrammus unilineatus* GILL, Ann. Lyc. nat. hist. N. Y., 1858, 6, p. 420 (Trinidad); GÜNTHER, Cat. fishes Brit. mus., 1864, 5, p. 317.  
*Tetragonopterus unilineatus* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 285, (Para, Brazil); GILBERT, Proc. Wash. acad. sci., 1900, 2, p. 163 (Pernambuco).  
*Tetragonopterus (Hemigrammus) unilineatus* REGAN, Proc. Zool. soc. London, 1906, p. 384 (Trinidad).  
*Hemigrammus unilineatus* EIGENMANN and OGLE, Proc. U. S. N. M., 1907, 33, p. 12 (Trinidad); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 332; pl. 48, fig. 1; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança; Maciél, Rio Guaporé).

HABITAT.—Trinidad, Guianas, and Amazons.

#### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
5779 I.	5	28-38	Para, Brazil	Hartt
10801 I.	1	40	Los Castillas, Venezuela	Riddle
1440 C., 11898 I.	110	35-48	Creek in Moro Passage	Shideler
1441 C., 11899 I.	22	31-41	Creek in Barima River	Shideler
1442 C., 11900 I.	86	23-48	Aruka River	Shideler

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
1443 C., 11901 I.	7	32-52	Isoro Mud Creek	Shideler
1444 C., 11902 I.	26	26-53	Mud flats in Demerara River below Wismar	Eigenmann
1445 C.	1	37	Georgetown Trenches	Eigenmann
1446 C., 11903 I.	4	41-47	Wismar	Eigenmann
1447 C., 11904 I.	5	35-47	Cumaka, Demerara River	Eigenmann
3043 C.	24	27-48	Bragança	Haseman
3044 C.	9	31-38	Maciél, Rio Guaporé	Haseman

Head 3.75; depth 2.2-3; D. 11; A. 23 to 27; scales 5-32 to 34-3 to 4.5; eye 2.25 to 2.5 in the head; interorbital narrower than the eye, 3 in the head.

Compressed, deepest at the vertical of the first dorsal ray; depth of head at base of occipital process three fifths in the greatest depth. Preventral regions rounded, without complete series of median scales. Predorsal region rounded without a regular series of median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital almost flat. Frontal fontanel very narrowly triangular, two thirds the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below it. Mouth moderately large; maxillary equal to the eye; mandible a little longer, half the length of the head. Premaxillary with two to four conical or tricuspid teeth in the outer row and five or six, tricuspid teeth in the inner row. Maxillary with six small conical and tricuspid teeth. Dentary with a graduated series of five, 3- to 5-pointed teeth and a series of twelve or more minute conical ones on the sides.

Gill-rakers 6 + 10.

Basal third of caudal scaled. Anal sheath rudimentary or wanting. Lateral line with pores on 5 to 8 scales.

Origin of the dorsal equidistant from the snout and caudal, its penultimate ray one third of the longest which is 3.25 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal deeply emarginate. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals overlapping the anal a distance equal to half the length of the eye. Pectorals overlapping ventrals the same distance.

Dorsal black except the tips of the anterior 5 or 6 rays. An oblique black line on the anal from the base of the first to the tips of the fourth and fifth rays. Humeral spot vertically elongate, often faint and sometimes lacking. No caudal spot. Lateral stripe narrow. Scales of the back outlined with dusky.

## 4. HEMIGRAMMUS ELEGANS (Steindachner).

Plate 17, fig. 3.

*Tetragonopterus elegans* STEINDACHNER, Flussf. Südam., 1882, 4, p. 36, pl. 7, fig. 4 (Obidos); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 285; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 285.  
*Hemigrammus elegans* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 12; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20734	4	27-30	Santarem	Bourget
20869	1	35	Tapajos	Dexter, James, & Talisman
20840 <sup>1</sup>	1	28	Obidos	James

Head 3.5-3.67; depth 2.67-3; D. 11; A. 23 or 24; scales 5-30 to 33-4.5; eye 2.25-25; interorbital 3.

Compressed; depth of head at base of occipital process 1.75 in the greatest depth. Preventral region rounded; no regular series of median scales. Predorsal region rounded, with a regular median series of 9 scales.

Occipital process one fourth of the distance from its base to the dorsal, bordered by three scales, interorbital almost flat; frontal fontanel almost equal to the parietals without occipital groove. Second suborbital leaving a narrow naked area behind and below. Mouth large. Maxillary barely as long as the eye, mandible equal to the eye. Snout very blunt, equal to half the length of the eye. Premaxillary with an outer series of three 5-pointed teeth, and an inner series of five teeth, the center one of which has five cusps, the next three to six cusps each and the end one seven. The maxillary with three, 5-pointed teeth broader than those of the outer premaxillary series. Dentary with five, 3- to 5-pointed teeth followed by a few conical ones on the sides.

Gill-rakers about 7 + 10.

Caudal only partially scaled. Anal sheath of six scales covering the bases of the first seven rays. Lateral line with pores on from seven to eleven scales, not decurved.

Origin of dorsal a very little nearer snout than caudal. Penultimate ray three in the longest which is 2.75 in the length. Caudal probably equal to

<sup>1</sup> In part.



the head. Origin of the anal on the vertical from the eighth or ninth dorsal ray. Ventrals on a vertical from the first or second scale in front of the dorsal. Ventrals reaching just to the anal. Pectorals reaching to the ventrals.

The distal three fourths of the first, second, and third, and distal one fourth of the fourth dorsal rays pigmented. An oblique blackish line passing over the basal fifth of the third, the entire fourth and fifth, and the tips of the sixth and seventh anal rays. The first and distal half of the second and third anal rays, with intervening membrane, with a milk-white elongate spot. A very slender dark gray lateral stripe from the caudal peduncle to the vertical from the dorsal. A few chromatophores, much scattered and very faint, occur in the humeral region. The one 35 mm. specimen from Tapajos differed from the rest in the anal marking. In it the oblique line was lacking, giving place to a semicircular dark spot including the tips of the sixth, seventh, and eighth rays.

#### 5. HEMIGRAMMUS ERYTHROZONUS Durbin.

Plate 21, fig. 4.

*Hemigrammus erythrozonus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 56 (Erukin); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 333, pl. 48, fig. 2.

HABITAT.—British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1448 C. Type	1	32	Erukin	Eigenmann
1449 C. Paratypes	32	21-33	Erukin	Eigenmann
11905 I. Paratypes				

Head 3.75; depth 3.33 to 3.75; D. 11; A. 20-22; scales 5-31 to 34-3 to 3.5; eye 2.5 in the head, snout 1.5 in the eye. Interorbital less than eye, about 2.75 in head.

Compressed; depth of head at base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete, regular series of median scales. Predorsal region rounded, median series of scales incomplete, always more or less irregular near the head.

Occipital process from one sixth to one seventh of the distance from its base to the dorsal; bordered by 3 scales. Interorbital convex. Frontal fontanel much narrower than parietal, triangular, two thirds of the parietal

without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short; mouth moderately large. Maxillary 1.33 in the eye. Mandible equal to the eye, 2.5 in head, much weaker than the upper jaw. Width of naked area of the cheek 4 in the eye. Pre-maxillary with five 3- to 5-pointed teeth in the inner row, and two or three narrow tricuspid teeth in the outer row. Maxillary with two to four, 3- to 5-pointed teeth. Dentary with four or five, 5- to 7-pointed teeth in a graduated series, followed by seven or eight minute tricuspid and conical teeth on the sides.

Gill-rakers 8 + 6.

Anal sheath short, of three scales covering the bases of the first five anal rays. Caudal scaled over the basal one fourth. Lateral line with pores on six to nine scales.

Origin of dorsal equidistant from the snout and caudal, penultimate ray one third the longest which is 3.67 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal deeply emarginate, longest ray 1.25 in the length of the base. Caudal equal to the length of the head. Ventral on the vertical from the second scale in front of the dorsal. Ventrals just reaching the first or second anal rays. Pectorals reaching the first scale in front of ventrals.

No true humeral spot; pores and margins of the first three or four scales in the lateral line heavily outlined with dusky and a group of large chromatophores just behind the eye on the head give the appearance of a humeral spot. Web of distal half of dorsal, almost all of the caudal, all of the ventrals, pectorals, and the web between the first seven anal rays dusky. Often a faint little dark spot at the base of each caudal lobe, no true caudal spot. Scales of the back and upper one third of the sides outlined with dusky. A broad stripe without chromatophores cherry-red in life, extends from the head to the caudal and halfway to the end of the middle caudal rays. Below this lateral stripe a dusky stripe two scales in width extends the length of the body. The belly and a streak on the sides, from just above the bases of the anterior ten anal rays to the mandible, without chromatophores. Bases of the anal and under side of the caudal peduncle black to dusky. Lips dusky. Dorsal lobe and upper part of the iris cherry-red in life.

## 6. HEMIGRAMMUS MARGINATUS Ellis.

Plate 20, fig. 1.

*Hemigrammus marginatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 159, pl. 3, fig. 3 (Queimadas).

HABITAT.—Head waters of Parana, Paraguay, Guaporé, Itapicurú, and San Francisco Rivers.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
3053 C. Type	1	38	Rio Itapicurú, Queimadas	Haseman
3054 C. Paratypes	22	13–39	Rio Itapicurú, Queimadas	Haseman
3055 C. Paratypes	3	23–29	Boqueirão near mouth of Rio Preto	Haseman
3056 C. Paratypes	4	28–30	Santa Rita, Rio Preto	Haseman
3057 C. Paratypes	3	29–33	Lagoa da Porto, near Barra, Rio San Francisco	Haseman
3058 C. Paratypes	6	26–38	Jacobina, Rio Jacobina, Itapicurú Basin	Haseman
3059 C. Paratypes	18	33–38	Pirapora, Rio San Francisco	Haseman
3060 C. Paratypes	42	18–42	Lagoa Pereira, Barra	Haseman
3061 C. Paratypes	5	37–42	Jaguara, Rio Grande	Haseman
3062 C. Paratypes	5	32–39	Rio Paiaia, Itapicurú Basin	Haseman
3063 C. Paratypes	8	32–38	Barreiras, Lagoas of Rio Grande, San Francisco Basin	Haseman
3064 C. Paratypes	6	22–38	Sete Lagoas, Rio das Velhas	Haseman
3065 C. Paratypes	3	29–35	Tinho, Rio Itapicurú	Haseman
3082 C. Paratypes	1	40	Maciel, Rio Guaporé	Haseman
3084 C. Paratypes	1	28	Mogy Mirim, a creek in São Paulo, Parana Basin	Haseman
C. Paratype	2	40–42	Rio Zinga, Itapicurú Basin	Haseman
3066 C. Paratypes	9	26–32	Riberão, Azul Lagoa 12 miles from Tieté	Haseman
3067 C. Paratype	1	21	Sapucay, Paraguay	Haseman
3077 C. Paratype	1	40	Caceres, Paraguay	Haseman
3083 C. Paratype	1	34	Rio Itapicurú, fazenda de Amaratu, 6 miles north of Bom Fin	Haseman

Head 3.6 to 3.8; depth 2.8 to 3.25; D. 11; A. 20 to 24; scales 5–29 to 34–3 to 4. Eye 2 in the head. Interorbital less than the eye, 2.75 in the head.

Compressed; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral and predorsal regions rounded, without complete series of median scales.

Occipital process 5 or 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel triangular, almost as wide as the parietal and as long as the parietal without the occipital groove. Second suborbital little more than half the eye in width, usually with narrow naked margins behind and below. Mouth large; snout little more than half the length of the eye. Maxillary slender, just, or not quite, equal to the eye; 2 to 2.3 in the head. Mandible equal to the eye. Premaxillary with three or four tricuspid teeth in the outer row, and four or five, rarely six, 3- to 5-pointed teeth in the inner row. Maxillary with two or three, less often four, 3- to 5-pointed teeth, the posterior one sometimes conical. Dentary with a graduated series of four or five 3- to 5- and 7-pointed teeth, followed by a series of seven to twelve minute, conical ones on the sides.

Gill-rakers 6 + 10.

Caudal scaled over the basal one half. Anal sheath short, consisting of about 6 scales over the bases of the first 10 rays. Lateral line with pores developed on 5 to 14 scales.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray short, one fourth of the longest, which is 3.67 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal emarginate, the longest ray 1.25 in the length of the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals just reaching the anal. Pectorals just, or not quite, reaching the ventrals.

No humeral spot. Caudal spot faint or lacking. A heavy leaden lateral stripe often somewhat expanded near the end of the caudal peduncle, narrowed in the region just below the dorsal. Dorsal and anal somewhat dusky. A broad black marginal or submarginal band across the caudal lobes. When this band is submarginal the middle caudal rays are black also. The base of the caudal lobes hyaline, probably orange or red in life. Scales of the back and sides, above the lateral stripe outlined with dusky. Sides below the lateral stripe with pale bluish iridescence.

## 7. HEMIGRAMMUS NANUS (Lütken).

Plate 18, fig. 1; Plate 78, fig. 2, 7.

*Tetragonopterus nanus* LÜTKEN, Overs. K. Dan. selsk. Forh., 1874, p. 133 (Lagoa Santa); Vidensk. selsk., 1875, 12, p. 218, pl. 5, fig. 17 (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 282; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286.

*Hemigrammus nanus* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, **33**, p. 15; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 435.

HABITAT.—San Francisco Basin.

44958 U. S. N. M., 4 Cotypes

Lagoa Santa

Reinhardt

Head 3.9; depth 3.5–4; D. 11; A. 17–19; scales 35–30 to 32–2.5 to 3; eye 2.2 in the head, interorbital narrower.

Compressed; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded with complete median series of 11 scales.

Occipital process one seventh of the distance from its base to the dorsal, bordered by two and a half scales. Interorbital region somewhat convex. Second suborbital leaving a narrow naked area below and a much narrower one behind. Maxillary much shorter than the eye, 3.25 in the head. Mandible nearly as long as the eye, 2.75 in the head. Premaxillary with four, 3-pointed, teeth and sometimes one conical tooth in the inner row, and two similar but narrower teeth in the front row. Maxillary without teeth or with one tooth.

Caudal probably scaled; anal sheath of probably a single series of scales extending the entire length of the base of the fin. Lateral line with pores on from 4 to 7 scales.

Origin of the dorsal half length of the eye nearer the caudal than the snout, penultimate ray one third of the longest which is 4.2 in the length. Origin of the anal on the vertical from the last dorsal ray. Height of the anal nearly equal to the length of its base. Anal emarginate. Base of the ventrals on the vertical from the second or third scale in front of the dorsal. Ventrals not quite reaching the anal, and pectorals almost reaching the ventrals.

Fins all hyaline except where the large, diffuse dark caudal spot extends over the caudal, often reaching the ends of the middle rays. No humeral spot. An inconspicuous, silvery lateral band. The scales of the back outlined with pigment, a few chromatophores scattered over the sides except above the body-cavity.

#### 8. *HEMIGRAMMUS LEVIS* Durbin.

Plate 18, fig. 2.

*Hemigrammus levis* DURBIN, Bull. M. C. Z., 1908, **52**, p. 100 (Lago do Maximo); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Santarem).

HABITAT.—Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20738 Type	1	47	Lago do Maximo	Agassiz
20738 Paratypes	201	35-48	Lago do Maximo	Agassiz
20838 Paratypes	18	33-45	Chidas	James
20829 Paratypes	3	38-44	Chidas	James
20716 Paratypes	63	34-41	Villa Bella	Agassiz
20749 Paratypes	35	44-47	Lake Jose Assu	Agassiz
3088 C.	2	31, 38	Santarem	Haseman

Head 3.5 to 3.66; depth 3.2 to 3.6; D. 11; rarely 10; A. 17-20; scales 5-30 to 34 to 3.5; eye 2.5 to 2.67 in the head; interorbitals slightly less than the eye.

Compressed, head short, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, usually without complete series of median scales; sometimes a more or less regular series of 12 or 13 scales, the last enlarged. Predorsal region rounded, a regular median series of 9 scales.

Occipital process one sixth of the distance from its base to the origin of the dorsal. Bordered on the side by two or three scales. Interorbital slightly convex. Frontal fontanel narrowly triangular, just or a little less than equal to the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below it. Maxillary equal to the length of the eye. Mandible a little longer than the eye. Snout short, about 1.3 in the length of the eye; mouth large. Premaxillary with three, sometimes four, 3-pointed teeth in the outer row, and five, the middle 6- to 7- and the rest 7- to 9-pointed teeth in the inner row. Maxillary without teeth. Dentary with five large or four large and one small, 7- to 9-pointed teeth, several minute conical teeth on the sides.

Gill-rakers 8 + 12.

Anal sheath short, consisting of 2 or 3 scales covering the bases of the first 6 or 7 rays. Lateral line developed on from 6 to 11 scales.

Origin of the dorsal equidistant from snout and caudal. Penultimate ray 2.33 in the longest which is 3.67 to 4 in the length. Caudal equal to the length of the head.

Origin of the anal on the vertical from the first or second scale behind the dorsal. Ventrals on the vertical from the origin of the dorsal. Pectorals not reaching the ventrals; ventrals almost reaching the anal.

Middle caudal rays with a round black spot; all other fins unmarked. A slate-black lateral stripe beginning on the vertical of the adipose fin and gradually fading out again just below the origin of the dorsal. A silvery stripe on the scales below the lateral stripe. All of the scales below and half of the row just above the lateral stripe more or less covered with greenish golden iridescence that partakes of a turquoise tinge as it approaches the anal, especially in specimens from Lago do Maximo and Lake Jose Assu, Brazil.<sup>1</sup>

#### 9. HEMIGRAMMUS MICROPTERUS Meek.

Plate 18, fig. 3; Plate 78, fig. 6.

*Hemigrammus micropterus* MEEK Ms., Proc. U. S. N. M., 1907, 33, p. 15 (Los Castillas); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

One specimen 10802 I      35 mm.      Los Castillas, Venezuela      O. Riddle

Head 3.8-4; depth 3.2; D. 10 or 11; A. 24; scales 4-32-4; eye 2.75 in the head, interorbital about equal to the eye.

Compressed, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, with complete median series of 10 scales. Postventral region not so narrow as in most species of the genus. Predorsal region rounded with complete median series of 9 or 10 scales.

Occipital process 5 or 6 in the distance from its base to the dorsal. Interorbital slightly convex. Frontal fontanel triangular and equal to the parietal without the occipital groove. Second suborbital in contact with the preopercle behind and below. Snout short and narrow, mouth rather small. Maxillary about equal to the eye. Mandible a little longer, 2.25 in the head. Pre-maxillary with an inner series of five, 5- to 7-pointed teeth and an outer series of two narrowly tricuspid teeth. Maxillary with one 7-pointed tooth. Dentary with a graduated series of five, 3- to 5-pointed teeth and a row of minute conical teeth on the sides.

Gill-rakers 6 + 9.

Anal sheath short, consisting of 1 or 2 scales. Lateral line with pores on 4 or 5 scales.

Origin of the dorsal equidistant from snout and caudal, the penultimate ray four ninths of longest which is 4 in the length. Origin of the anal on the vertical from the second scale back of the dorsal, anal slightly emarginate,

<sup>1</sup> One specimen from Lago do Maximo with a complete lateral line.



rather narrow. Caudal equal to the head. Ventral on the vertical from the first dorsal ray. Ventrals not quite reaching to the anal. Pectoral reaching to within one scale of the ventrals.

Fins all a little dusky, without definite markings. No humeral spot. A narrow black lateral stripe, faint from the head to the vertical from the origin of the anal and ending abruptly before it meets the caudal spot, which is continued to the end of the middle caudal rays. Scales of the back with rather broad dark margins.

10. *HEMIGRAMMUS HYANUARY* Durbin.

Plate 18, fig. 4.

*Hemigrammus hyanuary* DURBIN Ms. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

Eight specimens 20955

40-44 mm.

Lake Hyanuary

Navez

Head 3.5-4; depth 3.6-3.8; D. 11; A. 14-15; scales 5-32 or 33-3; eye 2.67 in head, snout 1.5 in the eye; interorbital almost equal to the eye, very nearly 2.75 in the head.

Compressed, depth of head at base of occipital process 1.25 to 1.33 in the greatest depth. Preventral region rounded without complete series of median scales. Predorsal region rounded with regular median series of about 9 scales.

Occipital process about 8 in the distance from its base to the dorsal, bordered by 2 and 1.5 scales. Interorbital almost flat. Frontal fontanel much narrower than the parietal, equilaterally triangular, very small about one fourth the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short but not so short as in *H. matei*; mouth large. Lower jaw included only when the mouth is closed. Maxillary 1.25 in the eye. Mandible about equal to the eye, 2.75 in the head. Premaxillary with four, narrow, tricuspid teeth in the outer row, and five, rarely six, large 3- to 5-pointed teeth in the inner row. Maxillary with one or two narrow 4-pointed teeth. Dentary with four or five large 4- to 6-pointed teeth in a graduated series followed by five or six minute teeth on the sides.

Gill-rakers 6 + 8.

Lateral line with pores developed on 8 to 10 scales.

Origin of the dorsal less than the length of the eye nearer the snout than the caudal; penultimate ray one third of the longest which is 3.75 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Anal

emarginate, the longest ray equal to the base. Anal armature developed on males. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals reaching the first to third anal rays. Pectorals usually just reaching the ventrals.

Humeral spot absent, (a small and faint round spot on two specimens). Caudal spot very dark, round or vertically elongate, entirely covering the middle caudal rays. Usually extending forward onto the caudal peduncle so as to give the spot a roughly triangular shape, placed rather below the middle of the peduncle. Scales of the back dusky; those on the sides above the narrow lateral stripe outlined with dusky. The first half of the anal rays, all of the dorsal, ventrals, and pectorals dusky. Scales below the lateral stripe with bright greenish iridescence. An uneven iridescent spot on the caudal peduncle above and in front of the caudal spot.

#### 11. HEMIGRAMMUS MATEI Eigenmann.

Plate 19, fig. 1.

*Hemigrammus matei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

One specimen 11438 I. Type

43 mm.

Argentina

Head 3.75-4; depth 3; D. 10; A. 23; scales 5-32 to 34-3; eye 2.2 in the head, snout 2 in the eye, interorbital slightly less than the eye, 2.6 in the head.

Compressed; depth of the head at the base of the occipital process, 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of 10 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel not narrower than the parietal, triangular and 1.25 in the length of the parietals without the occipital groove. Second suborbital in contact with the preopercle. Snout short and blunt, mouth large. Maxillary equal to or slightly less than the eye. Mandible a little longer than the eye, 2.14 in the head. Opercle incised above. Premaxillary with five or six 2- to 5-pointed teeth in the inner row and two or three similar but narrower ones in the outer row. Maxillary with three teeth, the posterior one 3-pointed, the anterior one 5-pointed. Dentary with graduated series of four or five teeth and several minute conical ones on the sides.

Gill-rakers 4 + 10.

One third of caudal scaled. Anal sheath of about 5 scales covering the basis of the first 8 anal rays. Lateral line with pores on 3 to 7 scales.

Origin of the dorsal one third of the length of the eye nearer to the caudal than to the snout, its penultimate ray two fifths of the longest which is 3.5 in the length. Origin of the anal on the vertical from the seventh anal ray. Anal emarginate, the longest ray 1.33 in the length of the base. Caudal somewhat shorter than the head. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals not quite reaching the anal; pectorals reaching a little beyond the origin of the ventrals.

No shoulder-spot; a black lateral band beginning over the middle of pectorals as a thin line, becoming gradually broader to the caudal peduncle where it expands more rapidly, abruptly contracted at the base of caudal but continued for a short distance on the middle rays, the markings on the caudal being arrow-shaped. Back dusky, except the upper surface of upper caudal rays, and a spot behind the adipose. Fins all dusky. Spot on the back behind the adipose iridescent, yellowish, practically free from pigment.

## 12. HEMIGRAMMUS RODWAYI Durbin.

Plate 21, fig. 3.

*Hemigrammus rodwayi* DURBIN, Ann. Carnegie mus., 1909, 6, p. 58 (Georgetown Trenches), EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 334, pl. 48, fig. 3; ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança; above Cachoeira, Rio Nova, Goyaz, Piabana).

HABITAT.—Lowland rivers from the Orinoco to Para, also Rio Nova.

### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
1450 C. Type	1	46	Georgetown Trenches	Eigenmann
1451 C., 11906 I.	183	38–49	Georgetown Trenches	Eigenmann
Paratypes				
1452 C., 11907 I.	112	28–53	Botanic Garden, Georgetown	Shideler
1453 C., 11908 I.	4	24–26	Mud Creek in Aruka River	Shideler
1454 C., 11909 I.	7	34–40	Creek in Barima River	Shideler
3045 C.	6	31–40	Bragança	Haseman
	2	42–45	Georgetown Trenches	Ellis
12656 I.	3	31–36	Lama Stop-Off	Eigenmann
2949 C.	1	27	Above Cachoeira Rio Nova into Somno, into Tocantins, Goyaz	Haseman

Head 4; depth 2.75-3; D. 11; A. 22-24; scales 5-32 to 34-2.5 to 3.5; eye 2-2.33 in the head; snout 7.5 in the eye, interorbital very nearly equal to the eye, 2.4 to 2.5 in the head.

Compressed; depth of head at the base of occipital process 1.5 to 1.2 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, sometimes with complete series of 9 or 10 median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel narrower than the parietal, triangular and almost as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short, mouth moderately large. Maxillary not quite equal to the eye. Mandible a little longer than the eye, 2-2.4 in the head. Preopercle not deeply incised above. Premaxillary with four or five, 4- to 5-pointed teeth in the inner, and three or four tricuspid teeth in the outer row. Maxillary with two or four small uni- bi- or tricuspid teeth. Dentary with a graduated series of four, 5- to 7-pointed teeth, and several minute conical ones on the sides.

Gill-rakers 10 + 6.

Caudal much scaled. Anal sheath of about 5 scales covering the bases of the first 6 to 8 anal rays. Lateral line with pores on 9 to 12 sometimes on 15 scales.

Origin of the dorsal equidistant from snout and caudal, penultimate ray one third of the longest which is 3.5 in the length. Origin of the anal on the vertical from the first or second scale behind the dorsal. Anal deeply emarginate, longest ray 1.5 to 1.33 in the length of the base. Caudal half the length of the eye longer than the head, ventral lobe slightly larger than the dorsal lobe. Ventrals on the vertical from the first scale in front of the dorsal, just reaching the anal. Pectorals either not quite or just reaching the ventrals.

No shoulder-spot. A silvery lateral stripe extending from the caudal to about the vertical from the first dorsal rays, and continued forward by a few large scattered chromatophores. The black caudal spot usually extending nearly or entirely to the end of the middle caudal rays. Scales of the back and sides outlined with pigment above the lateral stripe, an olive stripe along the back, sides above stripe straw colored, scales below the stripe with a light blue iridescence. No iridescent spot on the back of the caudal peduncle. All fins somewhat dusky. Males with a cherry-red spot on the base of each caudal lobe, anterior anal margin with a white bar, broadest towards the tip, the rest

of anal and the base of dorsal tinged with red. Females with yellow on caudal, anal, and dorsal in place of the red described in the case of males. The white bar on anal lacking in females.

### 13. HEMIGRAMMUS BREVIS Ellis.

*Hemigrammus brevis* ELLIS, Ann. Carnegie mus., 1911, 8, p. 161, pl. 3, fig. 4 (Barreiras).

HABITAT.—San Francisco Basin.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3068 C. Type	1	35	Barreiras, Lagoas of Rio Grande of San Francisco Basin	Haseman
3069 C. Paratypes	2	31, 33	Penedo, Rio San Francisco	Haseman
3070 C. Paratypes	3	34-36	Barreiras, Lagoas of Rio Grande	Haseman
3071 C. Paratypes	33	20-27	Boqueirão, Rio Preto	Haseman

Head 3.5; depth 2.6; D. 11; A. 20 to 22; scales 5-29 to 33-3 to 4. Eye 2 to 2.3 in the head; interorbital less than the eye, 2.7 in the head.

Compressed; depth of head at the base of the occipital process about 1.6 in the greatest depth. Preventral and predorsal regions rounded.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital slightly convex. Frontal fontanel triangular, as wide as the parietal, and almost equal to the parietal without the occipital groove. Second suborbital in contact with the preopercle. Mouth large, snout short, little more than one half the eye. Maxillary and mandible approximately equal to each other and to the eye. Premaxillary with three to five tricuspid teeth in the outer row, and five, rarely four, 3- to 5-pointed teeth in the inner row. Maxillary with one to three, 3- to 5-pointed teeth. Dentary with a graduated series of five 5-pointed teeth followed by a series of seven to eleven minute tricuspid and conical ones on the sides.

Gill-rakers 10 + 9 with 5 minute spines behind the last two on the shorter limb.

Caudal scaled over the basal one half. Anal sheath short, composed of 5 scales covering the bases of the first 9 anal rays. Lateral line with pores developed on the first 5 to 9 scales.

Origin of the dorsal equidistant from the snout and the caudal; penultimate ray about one fifth of the highest, which is 3.67 in the length. Caudal

very little longer than the head. Origin of anal on the vertical from the last dorsal ray. Anal deeply emarginate, the longest ray 1.25 in the anal base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching the second to fourth anal ray. Pectorals reaching to the first scale in front of the ventrals or to the second scale behind the ventrals.

No humeral spot. Caudal spot not quite as wide as the caudal peduncle, but extending from the tips of the middle caudal rays to the vertical from one of the last five anal rays, more diffuse at the anterior end. Lateral stripe very faint, heavily overlaid with silvery. Fins all a little dusky. Scales of the back outlined with dusky. Cheeks and sides below the lateral stripe with bluish iridescence.

#### 14. HEMIGRAMMUS TRIDENS Eigenmann.

Plate 19, fig. 2; Plate 78, fig. 4.

*Hemigrammus tridens* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 15 (Arroyo Pypucu); Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Arroyo Pypucu, Paraguay.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
11262 I. Type	1	20 to base of caudal	Arroyo Pypucu, Paraguay	Anisits
11262a I.	2	17, 18 to base of caudal	Arroyo Pypucu, Paraguay	Anisits

Head 3.4; depth 3; D. 11; A. 16–19; scales probably 4 to 5–30 to 35–3; eye 2.4 in head, interorbital 3+ in the head.

Compressed, depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral region rounded without complete series of median scales. Predorsal region rounded or very slightly keeled, with complete regular series of 11 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2–2.25 scales. Interorbital slightly convex. Frontal fontanel triangular, its base narrower than the parietal and half as long as the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short, mouth large; maxillary shorter than the eye, 3 in the head. Mandible about equal to the eye. Premaxillary with an inner row of five teeth, with 5 long points, the middle one much the longest, the outer row with two nar-

row tricuspid teeth. Maxillary with two 5-pointed teeth, the points nearly equal in length. Dentary with a graduated series of four large, 4- or 5-pointed teeth and two quite small tricuspid ones.

Gill-rakers 6 + 10.

Anal sheath short. Lateral line with pores on 4 to 7 scales.

Origin of the dorsal almost the length of eye nearer the caudal than to the snout, longest ray 4 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Anal falcate, the longest ray equal to the length of the base; origin of ventrals on the vertical from the first scale in front of the dorsal, reaching the anal. Pectorals not reaching the ventrals.

Dorsal and anal very slightly dusky. No distinct humeral spot, a few scattering chromatophores forming a horizontally elongate bar extending from the head to vertical from the base of the ventrals, where the narrow black line-like lateral stripe begins. The caudal spot forms a jet-black band across the end of the tail, continued forward to a blunt median point upon the lateral stripe, and backwards along the edge of each caudal lobe and along the middle caudal rays, but not to their tips. Scales of the back outlined with pigment.

#### 15. HEMIGRAMMUS OCELLIFER (Steindachner).

Plate 19, fig. 3; Plate 21, fig. 2.

*Tetragonopterus ocellifer* STEINDACHNER, Flussf. Südamer., 1882, 4, p. 32, pl. 7, fig. 5, (Villa Bella; Cudajas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286 (Amazon and Solimoes Basin).

*Holopristis ocellifer* EIGENMANN, Smith. misc. coll. quart., 1903, 45, p. 145; EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 11.

*Hemigrammus ocellifer* ELLIS, Ann. Carnegie mus., 1911, 8, p. 162 (Bragança); EIGENMANN, Mem. Carnegie mus., 1912, 5, p. 335, pl. 48, fig. 4; FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 544, fig. 13 (Rio Madeira).

HABITAT.—Amazon; British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
Part of 20842	33	28-44	Obidos	Col. Bentos
21017	1	38	Curupira	Maj. Cotinho
20774	16	37-28	Tabatinga	Bourget
20969	5	31-36	Cudajas	Thayer & Bourget
1455 C., 11910 I.	109	26-37	Gluck Island	Eigenmann
1456 C., 11911 I.	3	small	Konawaruk	Eigenmann
1157 C., 11912 I.	4	28-29	Malali	Shideler
3046 C.	11	31-40	Bragança	Haseman



Head 3.25 to 3.5; depth 2.5 to 2.75; D. 10 or 11; A. 22 to 26; scales 5-30 to 33-3 to 3.5; eye 2.25 to 2.5 in head, snout little more than one half of the eye, interorbital about equal to the eye, 2.5 in the head.

Compressed; depth of head at base of occipital process 1.33 in the greatest depth. Preventral region rounded, sometimes with a regular median series of 11 scales. Predorsal region rounded with complete median series of 11 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by about 3 scales. Interorbitals slightly convex. Frontal fontanel not narrower than the parietal, equal to the parietals without the occipital groove. Second suborbitals leaving a narrow naked margin behind and below. Snout rather short; mouth large. Maxillary slightly less than the eye. Mandible very little longer than the eye, about 2.33 in the head. Premaxillary with five, 3- to 5-pointed teeth in the inner row, and two to four smaller, 3- to 4-pointed teeth in the outer row. Maxillary with two or three small tricuspid or conical teeth. Dentary with a graduated series of four large 5-pointed teeth, followed by nine or ten minute tricuspid and conical teeth.

Gill-rakers 6 + 11.

Anal sheath of about 13 scales, the first 7 extending over the bases of the first 11 anal rays, the remaining 5 or 6 quite small and inserted between the scales above the anal, but not touching the anal rays. Caudal scaled over the basal one third. Pores developed on 6 to 8 scales.

Origin of the dorsal half the length of the eye nearer the caudal than the snout, the penultimate ray one third of the longest, which is 3+ in the length. Origin of the anal on the vertical from the middle or last dorsal ray. Anal emarginate, the longest ray 1.33 to 1.5 in the length of the base. Caudal less than the width of the eye longer than the head. Ventrals on the vertical from the second scale in front of dorsal; ventrals reaching to second or third anal ray. Pectorals reaching a little beyond the base of ventrals.

Humeral spot distinct, vertically elongate, paralleled in front and behind by a bright bar nearly as wide as the humeral spot itself; a secondary, fainter, dark bar behind the posterior bright bar. A black (brown in very old alcoholic specimens) caudal spot not extending much, if at all, onto the middle caudal rays; a bright ring around the entire caudal peduncle, from the caudal spot to last anal ray, iridescent above the narrow sharp gray lateral stripe. The base of the caudal lobes and upper part of the peduncle a rusty red in life. Dorsal somewhat dusky, with an orange tinge when alive, caudal and anal

rays tipped with dusky black, distal third of second anal rays white. Anal, ventrals, and pectorals yellow in life. Scales of the back outlined with pigment, a few large chromatophores scattered over the cheeks.

16. *HEMIGRAMMUS BOULENGERI* Eigenmann.

Plate 78, fig. 3.

*Tetragonopterus fasciatus interruptus* EIGENMANN (in part, *non* Lütken) Ann. N. Y. acad. sci., 1894, 7, p. 634 (Rio Grande do Sul).

*Hemigrammus bouleengeri* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 15; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Rio Grande do Sul.

One specimen 11073 I. Type 45 mm. Rio Grande do Sul Von Ihering

Head 3.33; depth 2.66; D. 11; A. about 22, scales 5–30–3; eye 2.6 and interorbital 2.75 in the head.

Compressed; depth of head at the base of the occipital process 3 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with regular series of 11 scales.

Occipital process 7 in the distance between its base and the dorsal, bordered by 3.25 scales. Interorbital slightly convex. Frontal fontanel triangular, broader than, and two thirds as long as, the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout short; mouth large. Maxillary 2.75 and mandible 2.33 in the head. Premaxillary with five 5-pointed teeth in the inner series, and three tricuspid teeth in the outer series. Maxillary with one 3-pointed tooth. Dentary with a graduated series of five 5-pointed teeth and three very small, 3-pointed teeth.

Gill-rakers 6 + 8.

Caudal probably scaled. Lateral line with pores on about 7 scales.

Origin of dorsal half the length of the head nearer to the caudal than to the snout, penultimate ray 2.75 in the longest, which is almost 4 in the length. Origin of anal on the vertical from the first or second dorsal ray. Anal somewhat emarginate, longest ray 1.25 in the base. Ventrals on the vertical from a point 1.75 the length of the eye in front of the dorsal. Ventral reaching to the base of the fourth anal ray. Pectorals a little more than reaching the ventrals.

Humeral spot vertically elongate, distinct; a narrow black lateral line lying deeper than the caudal spot and not connected with it; caudal spot well

defined, not quite extending to the end of the middle caudal rays, lower half of the caudal with many pigment-cells and blackish, upper half hyaline; basal two thirds of anal dusky.

17. *HEMIGRAMMUS IOTA* Durbin.

Plate 22, fig. 7.

*Hemigrammus iota* DURBIN, Ann. Carnegie mus., 1909, 6, p. 60 (Gluck Island); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Essequibo River.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1458 C. Type	1	18	Gluck Island	Eigenmann
1460 C. 11914 I.	4	19-21	Rockstone	Eigenmann
Paratypes				
1459 C., 11913 I.	7	18-21	Gluck Island	Eigenmann
Paratypes.				

Head 3.6; depth 3.4; D. 11; A. 15-17; scales 5-30-3; eye 2.33-2.5; snout 1.67 in the eye. Interorbital slightly less than the eye, 2.8 in the head.

Compressed; depth of head at the base of occipital process 1.33 in the greatest depth. Preventral region rounded, usually without complete series of median scales. Predorsal region rounded, usually with complete series of 9 to 11 median scales.

Occipital process 7 or 8 in the distance from its base to the dorsal, bordered by 2 scales on each side. Interorbital convex. Frontal fontanel much narrower than the parietal, triangular, three fourths of the parietal without the occipital groove. Second suborbital covering the entire cheek. Snout short, mouth comparatively large. Maxillary 1.4 in the eye. Mandible a little longer than the eye, 2+ in the head. Premaxillary with five, 3- to 5-pointed teeth in the inner row and two or three narrow tricuspid teeth in the outer row. Maxillary with one or two broad teeth with 4 or 5 points. Dentary with a graduated series of four or five large, 5-pointed teeth, followed by four or five minute conical ones on the side.

Gill-rakers about 9 + 7.

Anal sheath short, of 7 scales, covering the base of the first 8 or 9 anal rays. Lateral line with pores on the first 6 to 8 scales.

Origin of dorsal less than half the length of the eye nearer the caudal than the snout. Penultimate ray two fifths of the longest, which is 3.2 in the length. Origin of the anal on the vertical from the first to third scale behind the dorsal. Anal deeply emarginate, the longest ray almost equal to the base. Caudal a very little longer than the head. Ventrals on the vertical from the second or third scale in front of the dorsal. Ventrals just reaching the anal, pectorals barely reaching the ventrals, more often only reaching to the second or third scale in front of the ventrals.

Humeral spot conspicuous, black, vertically elongate, surrounded by a small light area. Caudal spot variable in intensity, vertically elongate, I-shaped, not extending on to the caudal rays, and not continuous with the narrow black lateral stripe, which is overlaid with silvery. Scales of the postdorsal region each marked with a round dark spot in addition to a few scattered chromatophores. Scales of the predorsal region with round spots less distinct and the general dusky shading more pronounced. Scales of the sides above the lateral stripe outlined with dusky. A few chromatophores scattered over the region between the anal and the lateral stripe. Some indications of a very faint secondary humeral spot. Fins all a little dusky. Caudal with an orange spot on the base of each lobe (evident in fresh specimens only).

18. *HEMIGRAMMUS BARRIGONAE* Eigenmann and Henn.

Plate 93, fig. 2.

*Hemigrammus barrigone* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 24, p. 232 (Barrigona).

HABITAT.—Rio Meta, Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13423 I. Type	1	41	Barrigona, Rio Meta	Gonzales
13424 I. Paratypes	65	25-43	Barrigona, Rio Meta	Gonzales

Head 4; depth 2.6-3; depth of caudal peduncle 9-10; D. 11; A. 24-25. Scales 33-35 in a longitudinal series, about 11 in a transverse series. Development of scales with lateral line pores extremely variable and not even equal on both sides of the same specimen. Usually a continuous series of at least 14 scales with pores, thence lateral line discontinuous; pore usually developed on last scale in the series. One specimen has the lateral line 16 + 3 + 1 +

11 + 2, (the italicized numerals represent scales with pores). Another has 17 + 6 + 2 + 4 + 2 + 3. A specimen of 41 mm. has the lateral line 17 + 14 + 2 on the left side and 16 + 18 + 1 on the right side. Of others, one, 34 mm. has respectively 24 + 8 + 3 and 20 + 8 + 7; one, 37 mm. has 15 + 19 and 16 + 18; and one, 42 mm., has 24 + 5 + 5 on the left and 24 + 7 + 3 on the right side. The lateral line is developed on the seventh transverse series of scales. Scales in the type are 6-16 + 18 + 1-4. Eye 2.6 in head, about equal to or slightly greater than the interorbital.

Compressed, rather deep, caudal peduncle slender; predorsal area arched or rounded with a variable median dorsal series of from 9 to 12 (usually 10) scales; preventral area rounded, with an ill-defined median series of about 12 large scales. Occipital process about 5 in the distance from its base to the dorsal, bordered by three scales. Skull convex; fontanels moderately large; second suborbital in contact with the preopercle behind.

Mouth terminal; snout blunt, about one half the eye; maxillary short, about three fourths the length of the eye. Premaxillary with three tricuspid teeth in the outer row and five 5- to 6-pointed teeth in the inner row. Maxillary with four or five minute, 6-pointed teeth, visible only in preparations. Mandible with four or five 6-pointed incisors in each ramus, their tips flaring outwards. Caudal scaled over one third of the basal lobe. Gill-rakers 7 + 6.

Origin of dorsal about equidistant from snout and base of middle caudal rays, its height 3.5 in the length. Origin of anal on vertical from last ray of dorsal, fourth to sixth rays elongate, forming an anterior lobe, its height about 4.7-5 in the length, two large scales overlapping on the anterior margin. Caudal deeply forked, its lobes about equal to the height of the dorsal; pectorals do not reach the ventrals, the latter just overlap on the anal.

General coloration light olivaceous; operculum, cheeks, and snout underlaid with bright silvery. Top of head dusky, no predorsal median line. A broad horizontal lateral stripe from the hind margin of the operculum to the caudal base, here expanded to form an ill-defined, oval caudal spot. An indistinct humeral spot is overlaid by this lateral stripe. A conspicuous dark band along the entire anal base, outer margin of anal sometimes dark tipped. Fins otherwise without color.

## 19. HEMIGRAMMUS SCHMARDAE (Steindachner).

Plate 20, fig. 2; Plate 78, fig. 1.

*Tetragonopterus schmardae* STEINDACHNER, Flussf. Süd-am., 1882, 4, p. 37, pl. 7, fig. 6 (Tabatinga); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 54.

*Hemigrammus schmardae* FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 333 (Peruvian Amazon); EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 13; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem).

*Tetragonopterus santarensis* ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 283 (Santarem).

*Hemigrammus melanochrous* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 543, fig. 12 (Tributary of Rio Madeira near Porto Velho).

HABITAT.—Amazons.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
—	4	34-43	Manaos	Agassiz
5174 I.	1	28	Brazil	
5499 I.	2	29	Santarem	Menot
8085 C.	1	39	Santarem	Hasemann

Head 3.4-3.6; depth 3; D. 11; A. 20-23; scales 5-30 to 34-3 to 3.5; eye large, 2.3-2.5 in the head; interorbital 3 in the head.

Compressed; depth of head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded, with complete median series of 10 or 11 scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2.5 scales on the side. Interorbital region almost flat. Frontal fontanel triangular to truncate triangular, equal to the length of the parietal without the occipital groove. Second suborbital leaving a very narrow naked margin behind and below. Snout short, mouth large. Maxillary and mandible both long and equal to the eye. Premaxillary with 5 teeth in the inner row, four large, 4- to 5-pointed, and one very small; three small tricuspid teeth in the outer row. Maxillary with two or three small conical or tricuspid teeth. Dentary with a graduated series of four large, 5-pointed teeth, one very small tooth and twelve or more minute conical teeth on the sides.

Gill-rakers 7 + 9.

Anal sheath short, consisting of 4 scales covering the bases of the first 5 rays. Lateral line with pores on 7 to 16 scales.

Origin of the dorsal very slightly nearer the snout than the caudal, penul-

timate ray 2.5 in the longest, which is about 3.5–3.25 in the length. Origin of the anal on the vertical from the eighth or last dorsal rays. Anal emarginate, its longest ray 1.25 in the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching to the fifth anal ray. Pectorals often reaching a little beyond the base of the ventrals.

Fins all hyaline; humeral spot small, dark and surrounded by a ring of light, an inconspicuous silvery lateral stripe, widest at the vertical from the adipose, not reaching the caudal spot and subtended by a faint, slaty gray line; caudal spot almost as wide as the caudal peduncle, terminating abruptly before and more gradually behind, not, however, extending to the tips of the middle caudal rays. Sometimes a little black near the tips of the first anal rays. Scales of back and upper part of the sides broadly outlined with dusky. Scales below the lateral stripe with pale bluish and greenish iridescence.

## 20. HEMIGRAMMUS LUNATUS Durbin.

*Hemigrammus lunatus* DURBIN MS. EIGENMANN, Princeton univ. exped. Patagonia, 1910, **3**, p. 436 (Amazon); ELLIS, Ann. Carnegie mus., 1911, **8**, p. 162 (Caceres; Jaurú; Rio Boa Vista).

HABITAT.—Amazon Basin.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20964 Type	1	33		
20964 Paratypes	3	27–32		
20840 Paratype	1	32	Obidos	
3081 C.	5	24–45	Caceres	Haseman
2942 C.	2	46, 48	Jauru	Haseman

Head 3. to 3.2; depth 2.75; D. 11; A. 23 to 26; scales 5–33 to 34–3.5; eye 2.25 in the head, interorbital not quite equal to the eye, 2.5 to 3 in the head.

Very compressed; depth of head at the base of the occipital process about 1.5 in the greatest depth. Preventral region rounded, with a complete median series of 10 or 11 scales. Predorsal region narrowly rounded, with a complete median series of 10 scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital slightly convex. Frontal fontanel triangular, very nearly as wide as the parietal, equal to the parietal without the occipital groove. Second suborbital moderately wide, leaving a very narrow naked margin behind but sometimes none below. Snout short, mouth large. Maxil-



lary three fourths of the eye, about 3.25 in the head. Mandible equal to the eye. Premaxillary with four broad, tricuspid teeth in the outer row, and five 3- to 5-pointed teeth in the inner row. Maxillary with two or three conical or tricuspid teeth. Dentary with a series of four large, 5-pointed teeth followed by seven to ten small, conical or notched ones on the sides.

Gill-rakers about 6 + 11.

Anal sheath short, of about 5 scales covering the bases of the first 8 anal rays. Lateral line with pores developed on the first 10 or 11 scales.

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray two fifths of the longest, which is 3 in the length. Origin of the anal on the vertical from the last dorsal ray. Anal falcate, the longest ray almost equal to the base. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching to the third anal ray. Pectorals reaching the second scale beyond the base of the ventrals.

Humeral spot small, semicircular, the curved margin directed upwards always very faint and often lacking. No caudal spot. Lateral stripe a narrow, dark line overlaid with silvery. All the fins hyaline. A few chromatophores at the base of each anal ray. Sides below the lateral stripe faintly iridescent.

Two specimens, 45 and 48 mm. Rio Boa Ventura, (2943 c. m.) differ from the typical specimens of *H. lunatus* as follows:—the maxillary with two or three broad, 3-, 5- and 7-pointed teeth. Humeral spot very diffuse, lateral stripe not overlaid with silvery.

## 21. HEMIGRAMMUS MICROSTOMUS Durbin.

*Hemigrammus microstomus* DURBIN MS. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436 (Amazon); ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem).

HABITAT.—Amazon.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20782 Type	1	28	Santarem	Bourget
20782 } 20783 } Paratypes	19	23-30	Santarem	Bourget
20840 Paratypes	5	30-37	Obidos	James
20970	1	34	Cudajas	Thayer, Bourget
2944 C.	7	29-34	Santarem	Haseman

Head 3.6 to 4; depth 2.8 to 3.5; D. 11; A. 19 to 22; scales 5-31 to 34-3; eye 2.25 in the head; interorbital about equal to the eye, 2.3.

Compressed; depth of head at the base of the occipital process about 1.66 in the greatest depth. Dorsal profile only slightly arched. Preventral region rounded, without a complete series of median scales. Predorsal region rounded, often with a complete series of 9 to 11 median scales.

Occipital process 5 in the distance from its base to the dorsal. Interorbital very slightly convex. Frontal fontanel triangular, as wide as the parietal, three fourths the parietal without the occipital groove. Second suborbital narrow, leaving a narrow naked margin behind and below. Snout short, mouth very small. Lower jaw scarcely projecting beyond upper, even when the mouth is open. Maxillary convex in front, little more than half the eye, 3.5 in the head. Mandible equal to the eye. Premaxillary with two or three, 5-pointed teeth in the outer row, and four or five 5- to 7-pointed teeth in the inner row. Maxillary with two or three 4- to 7-pointed teeth. Dentary with five broad, 5- to 7-pointed teeth, followed by a series of several small teeth on the sides.

Gill-rakers 6 + 7.

Caudal scaled over the basal half. Anal sheath short, of about 3 scales, covering the base of first 5 or 6 rays. Pores developed on the first 7 to 9 scales of the lateral line.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray two fifths of the longest, which is 3.25 in the length. Caudal about one third the length of the eye longer than the head. Origin of the anal on the vertical from the second scale behind the dorsal. Anal almost falcate, the longest ray about 1.2 in the length of the anal base. Ventrals on the vertical from the first dorsal rays or the first scale in front of the dorsal. Ventrals just reaching the anal. Pectorals reaching the first scale in front of the ventrals.

No caudal spot, humeral spot small and round, usually faint and often lacking. A narrow, blackish, lateral stripe overlaid with silvery, from the base of the caudal to the humeral spot, if the humeral spot is present. Fins all hyaline. Scales of the back outlined with dusky. Bluish and greenish iridescence on the sides and cheeks.

## 22. HEMIGRAMMUS ORTHUS Durbin.

Plate 21, fig. 1.

*Hemigrammus orthus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 61 (Tukeit); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 143; Mem. Carnegie mus., 1912, 5, p. 336, pl. 48, fig. 5; ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem).

HABITAT.—British Guiana; Amazon.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1477 C. Type	1	28	Tukeit	Eigenmann
1478 C., 11912 I. Paratypes	17	22–30	Tukeit	Eigenmann
1479 C., 11922 I. Paratypes	25	14–21	Gluck Island	Eigenmann
1480 C. Paratype	1	27	Essequibo below Packeoo	
3600 C.	6	25–34	Hubabu Creek	Ellis
2945 C.	5	26–31	Santarem	Haseman
2948 C.	5	19–21	Konawaruk	Eigenmann

Head 3.75; depth 3.75; D. 11; A. 19 to 22; scales 5–30 to 33–3; eye 2.5 in the head; interorbital not quite equal to the eye, about 3 in the head.

Compressed; depth of head at the base of the occipital process about 1.33 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, probably with a complete series of 9 median scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales on the sides. Interorbital slightly convex. Frontal fontanel triangular, narrower than the parietal and not quite equal to the parietal without the occipital groove. Second suborbital leaving narrow naked margins behind and below. Snout a little more than one half the length of the eye. Mouth large. • Maxillary equal to the eye, narrow, slightly curved backwards, the two sides parallel to each other. Mandible equal to the maxillary. Pre-maxillary with three tricuspid or conical teeth in the outer row, and five, 3- to 5- or rarely 7-pointed teeth in the inner row. Maxillary with one to five tricuspid or conical teeth. Dentary with a graduated series of four or five large 3- to 5-pointed teeth.

Gill-rakers 7 + 14.

Caudal with 3 to 5 scales on the base of each lobe. Anal sheath short, of 3 scales covering the base of the first 6 anal rays. Lateral line with pores developed on about 7 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray one third of the longest which is 3.5 in the length. Origin of the anal on the vertical from last dorsal ray. Anal deeply emarginate, the longest ray about 1.25 in the base. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals just reaching anal. Pectorals just reaching ventrals.

A diffuse, round or somewhat vertically elongate, humeral spot. A dark lateral stripe, heaviest behind the origin of the anal, but not reaching the base of the caudal. No caudal spot. A black line at the base of the last anal rays not continuous with that at the base of the first seven. Dorsal, caudal, first seven rays of the anal, and first two or three rays of ventrals dusky. Scales of the back dusky, each often bearing a single black spot.

### 23. HEMIGRAMMUS CUPREUS Durbin.

Plate 20, fig. 3.

*Hemigrammus cupreus* DURBIN MS. EIGENMANN, Rept. Princeton univ. expd. Patagonia, 1910, 3, p. 436 (Amazon).

HABITAT.—Amazon.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20952 Cotypes	11	42-53	Jatuarana	Navez
21069 Cotypes	6	32-35	Silva, Lake Saraca	Thayer

Head 4; depth 3-3.75; D. 11; A. 20-22; scales 5 to 7-30 to 33-3 or 3.25; eye 2.9 in head; snout 1.25 in the eye; interorbital slightly less than the eye, 3 in head.

Compressed; depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete series of 9 median scales.

Occipital process 6 in the distance from its base to the origin of the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel narrower than the parietal, triangular, one half the parietal without the occipital groove. Second suborbital having a narrow naked margin below but not behind. Snout moderately long; mouth large; lower jaw protruding beyond the snout when

mouth is open. Maxillary 1.33 in the eye, much arched in front. Mandible longer than eye, 2.25 in head. Premaxillary with five to seven narrow, tricuspid teeth in the inner row, and two to three conical teeth in the outer row. Maxillary with three to five conical and tricuspid teeth. Dentary with a graduated series of five to seven tricuspid teeth, grading into a series of several minute conical teeth on the side.

Gill-rakers 6 + 10.

Anal sheath of 2 or 3 scales covering the bases of the first 7 to 9 anal rays. Lateral line with pores on 8 to 10 scales.

Origin of the dorsal equidistant between snout and caudal, penultimate ray one third of longest which is 3.75 in the length. Origin of anal on the vertical from the second scale behind the dorsal. Anal emarginate, longest ray a little longer than the base. Caudal the length of the eye longer than the head, slightly less than the basal half scaled. Ventrals on the vertical from the origin of the dorsal. Ventrals barely reaching the anal, pectorals not usually reaching the ventrals in specimens over 43 mm. long.

A faint, vertically elongate humeral spot, a slender black lateral stripe not reaching the caudal but overlaid with a silvery iridescent stripe which does extend to the caudal. The outer and sometimes the extreme tips of middle caudal rays slightly pigmented. The scales of the back and bases of the anal rays faintly outlined with brownish. A few chromatophores scattered over the dorsal and first anal rays. Iridescence on scales below the lateral stripe shading from rich copper on caudal peduncle to pale bluish on the lower series. No caudal spot.

#### 24. *HEMIGRAMMUS CYLINDRICUS* Durbin.

Plate 22, fig. 5.

*Hemigrammus cylindricus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 62 (Tumatumari); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 426; Mem. Carnegie mus., 1912, 5, p. 337, pl. 49, fig. 3.

HABITAT.—British Guiana.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1461 C. Type	1	57	Tumatumari	Eigenmann
1462 C., 11915 I. Paratypes	6	35-58	Tumatumari	Eigenmann
1163 C., 11916 I. Paratypes	11	46-54	Crab Falls	Eigenmann

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1464 C., 11917 I. Paratypes	20		Rockstone	Eigenmann
1465 C. Paratype	1	45	Gluck Island	Eigenmann
	54	45-108	Gluck Island	Gimbel Exped.

Head 3.3-3.66; depth 3.66-4.66; D. 11; A. 17 to 20; scales 5-30 to 34-3; eye large, slightly longer than wide, 2.75 in the head; interorbital almost flat, almost equal to the eye, 3 in the head.

Subcylindrical, or only slightly compressed; depth of head at the base of occipital process 1.25 to 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with a complete median series of 8 to 12 scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Interorbital nearly flat. Frontal fontanel small, triangular, narrower than the parietal; two thirds the parietal without the occipital groove. Second suborbital leaving considerable naked margins behind and below. Maxillary straight, 1.25 in the length of the eye. Mandible a little longer than the eye, 2.5 in the head. Premaxillary with three or four tricuspid teeth in the outer row, and six tricuspid teeth in the inner row. Maxillary with three to six tricuspid, or occasionally conical teeth. Dentary with a graduated series of four or five teeth also tricuspid.

Gill-rakers 6 + 9.

Caudal scaled over halfway to the end of the lobes. Anal sheath short, consisting of the edge of 3 large scales. Lateral line with pores developed on 7 to 12 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray one third the longest, which is 4 in the length. Origin of the anal on the vertical from the third scale behind the dorsal. Anal very deeply emarginate, the longest ray just reaching the base of the last ray. Ventrals on the vertical from the origin of the dorsal. Ventrals, just barely or not quite, reaching the anal, pectorals reaching the second scale in front of the ventrals.

Humeral spot small, roundish or roughly triangular, often intense. A black line at the base of the anal. A narrow black lateral stripe. No true caudal spot, sometimes a dusky spot at the base of each caudal lobe. Each scale of the back often with a single intense dark spot. Scales of the sides often outlined with dusky. Scales of all except the upper three series with

iridescence, the last few on the end and middle of the caudal peduncle rich copper. In life adipose yellow and dorsal yellowish.

25. *HEMIGRAMMUS ANALIS* Durbin.

Plate 22, fig. 2.

*Hemigrammus analis* DURBIN, Ann. Carnegie mus., 1909, 6, p. 64 (Rockstone); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 163 (Santarem); EIGENMANN, Mem. Carnegie mus., 1912, 5, p. 337, pl. 49, fig. 6.

HABITAT.—British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1466 C. Type	1	35	Rockstone	Eigenmann
1468 C., 11919 I. Paratypes	21	24–29	Gluck Island	Eigenmann
1467 C., 11918 I. Paratypes	72	19–36	Rockstone	Eigenmann
1469 C., 11920 I. Paratypes	2	29, 35	Wismar	Eigenmann
	1	30	Santarem	Haseman

Head 3.5–3.75; depth 3.25–3.50; D. 11; A. 12–14; scales 5–30 to 32–3; eye 2.33 in head, snout 1.5 in the eye, interorbital less than the eye, about 2.75 in the head.

Compressed; depth of head at base of occipital process 1.33 in the greatest depth. Preventral region rounded, without regular series of median scales. Predorsal region rounded, having a regular median series of 8 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by 2 or 3 scales. Interorbital flat. Frontal fontanel small, triangular, narrower than the parietal, half the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin below and behind. Snout short. Mouth large. Maxillary not so long as the eye. Mandible equal to the eye. Premaxillary with three or four 5-pointed teeth in the outer row, and five, 5- to 7-pointed teeth in the inner row. Maxillary with two or three 6- to 7-pointed chisel-shaped teeth. Dentary with four broad, 7-pointed teeth, followed by three or four minute teeth on the sides.

Gill-rakers about 6 + 9.

Caudal scaled halfway to the end of the longest rays. Anal sheath of 3

or 4 normal scales which extend over the bases of the first 7 or 8 rays. Pores developed on 7 or 8 scales.

Origin of the dorsal about equidistant from the snout and caudal, the penultimate ray 0.4 of the longest which is 3.67 in the length. Origin of the anal on the vertical from the second scale behind the dorsal; anal emarginate, longest ray equal to the base. Caudal half the length of the eye longer than the head. Ventrals on the vertical from the first dorsal ray; ventrals just reaching the anal. Pectorals not reaching the ventrals.

Humeral spot distinct but not heavy, not conspicuously elongated. Lateral stripe the width of one scale, not so intense as the humeral spot, expanded on the caudal peduncle, but not extending on the fin; scales overlying the lateral stripe distinctly silvery. No caudal spot. First five anal rays, the caudal and all of the dorsal dusky. Each median dorsal scale with a roundish dark spot. Scales of the upper half of the sides outlined with dusky. A few chromatophores scattered about the base of the anal and aggregated so as to form a small dark spot or line on the ventral side of the caudal peduncle. Top of the head dark. The lateral stripe probably red in life.

The single specimen from Santarem resembles very closely *H. analis*, and has 13 anal rays, but the maxillary has but one tricuspid tooth which is not typical.

#### 10. HYPHESSOBRYCON Durbin.

*ιψήσσων* = smaller, *βρυχω* = to gnash the teeth, from which Brycon a genus of Characins.

*Hyphessobrycon* DURBIN, Bull. M. C. Z., 1908, **62**, p. 100 (*compressus*).

*Dermatocheir* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 55, (*catablepta*).

TYPE.—*Hemigrammus compressus* Meek.

Like *Hemigrammus* but with the caudal naked.

The genus *Dematocheir* was based on a specimen with arrested pectoral development. Several other species have since been discovered with similar pectorals, but otherwise showing the characters of this and of other, quite distinct genera.

HABITAT.—Mexico to the La Plata, Pacific Slope of Ecuador.

#### Key to the Species.

- a. Scales 45–48, no lateral band, no caudal or humeral spots. D. 11; A. 25–27; scales 8–45 to 48–7.
- b. Dorsal with a conspicuous spot on basal half of anterior rays; maxillary equals eye.
  - 1. *compressus* (Meek).
- bb. Dorsal dark; anal mostly dark; maxillary less than eye; everywhere densely peppered with chromatophores.
  - 2. *milleri* (Durbin).



- aa. Scales not more than 36.
- c. Dorsal black or with a well-defined black spot. (See also *melanopleura*).
- d. Humeral spot present, anal unmarked with black or with black only on the tips of the rays.
- e. Dorsal black, a deep humeral spot, last five anal rays and distal two fifths of remaining anal rays black. D. 11; A. 27 to 30; scales 6 to 7.5-31 to 33-3.5. Maxillary with two tricuspid teeth. . . . . 3. *callistus* (Boulenger).
- ee. Basal part of dorsal not black.
- f. Maxillary with two or three teeth; inner row of premaxillary of five teeth.
- g. Maxillary teeth tricuspid; last few and frequently the first few anal rays with black on or near the tips.
- h. Humeral spot very small, black on anal subtended with white; depth 3.8; head at base of occipital process 1.33 in. the greatest depth; D. 11; A. 26; scales 5-32 to 34-3. . . . . 4. *minor* Durbin.
- hh. Humeral spot vertically elongate, anal rays often tipped with black; depth 2.75; head at the base of occipital process 1.5 in the greatest depth; D. 11; A. 25-27; scales 5-29 to 31-3.5. . . . . 5. *serpae* Durbin.
- gg. Maxillary teeth with 6 to 8 cusps, broad, set obliquely, overlapping; anal usually not black tipped. D. 11; A. 28; scales 5 to 7-24 to 27-3.5. . . . 6. *copelandi* Durbin.
- ff. Maxillary with about six, tricuspid or conical teeth; eight tricuspid teeth in the inner row of the premaxillary; base of caudal hyaline; lower fins dusky, ventrals sometimes reaching the fifth anal ray. D. 11; A. 27 to 30; scales about 30 to 33 . . . . . 7. *bentosi* Durbin.
- dd. No humeral or caudal spot.
- i. The black dorsal spot margined with white above. Maxillary with four to six tricuspid or conical teeth. D. 11; A. 26 or 27; scales 5-31 to 33-3. . . . . 8. *rosaceus* Durbin.
- ii. Maxillary without teeth; D. 11; A. 22; scales 5-34-3. . . . 9. *hasemani* Fowler.
- cc. Dorsal plain.
- j. No humeral spot.
- k. Caudal spot lacking or faint; premaxillary with five teeth in the inner row
- l. Fourteen scales in a vertical series; caudal spot entirely lacking, much compressed. Sides thickly peppered with small inconspicuous chromatophores. Maxillary with three conical or tricuspid teeth: D. 11; A. 25; 7-24 to 36-6. . . . . 10. *panamensis* Durbin.
- ll. Nine scales in a vertical series; caudal sometimes plain, with a faint spot. Maxillary with two minute teeth. Eye 2 to 2.5 in the head. D. 10 or 11; A. 17 to 24; scales 5-29 to 34-3.5 to 4. . . . . 11. *gracilis* (Reinhardt).
- kk. A small spot at the base of each caudal lobe; a row of spots along the base of the anal. Four to six small teeth in the maxillary. Ten to twelve, conical or tricuspid teeth in the second row of the premaxillary. D. 10 or 11; A. 19 or 20 scales 4 or 5-32 to 34-3.5. . . . . 12. *riddlei* (Meek).
- kkk. Caudal spot well developed, single.
- m. Maxillary without teeth, premaxillary with nine tricuspid teeth in the inner row. Lateral stripe silvery, no black; caudal spot confined to the peduncle. D. 10; A. 27; scales 5-32-3. . . . . 13. *stramineus* Durbin.
- mm. Maxillary without teeth, very short. Premaxillary with five broad 5- to 7-pointed teeth. Caudal spot continued forward as a heavy lateral stripe, often reaching the head. D. 11; A. 14 to 16; scales 5 or 6-32 to 36-4 or 5. . . . . 14. *taurocephalus* Ellis.
- mmm. Maxillary with or without one small conical tooth. Premaxillary with five 3-pointed teeth in the inner row. Caudal spot condensed or diffuse. D. 11; A. 20 or 21; scales 5-32 to 34-3 or 4. . . . . 15. *parvellus* Ellis.
- mmmm. Maxillary with two or three broad, 5- to 7-pointed teeth; premaxillary with five, 5- to 7-pointed teeth in the inner row. A black lateral stripe somewhat diffused in the humeral region, caudal spot continued on the middle rays but not to their end. D. 11; A. 16 or 17; scales 5-30 to 33-3. . . . . 16. *minimus* Durbin.

*mmmm*. Teeth strong, simply conic or tricuspid, and in the latter case of large size; maxillary with three cusps. Caudal spot continued on the middle rays but not to their tip. D. 11; A. 19; scales 33.

17. *stigmatias* Fowler.

*jj*. Humeral and caudal spot both developed. (See also *minimus* and *poeciloides*).

*n*. Fourteen or more scales in a vertical series, dorsal profile very convex. Maxillary with five small stout teeth. Humeral spot oval, not surrounded by a bright border. D. 11; A. 27; scales 7-35-6.

18. *robustus* Cope.

*nn*. Less than fourteen scales in a vertical series.

*o*. Lower part of caudal peduncle dark, the upper part of the peduncle light; second suborbital broad, in contact or nearly in contact with the preopercular limb.

*p*. Third anal ray extending to the base of the last ray. The dark spot on the caudal peduncle diffuse, covering little more than the lower half of peduncle; the part above the spot iridescent; maxillary with one to three, 3- to 5-pointed teeth; humeral spot obscure, round. D. 11; A. 22; scales 5-34-35.

19. *melazonatus* Durbin.

*pp*. Third anal ray not extending to the base of the last ray. Entire lower two thirds of caudal peduncle very black, no iridescence on the peduncle; humeral spot obscure much elongated vertically. Maxillary with five to seven very narrow conical and tricuspid teeth. D. 11; A. 17 to 20; scales 6-33 to 34-4.

20. *eos* Durbin.

*oo*. Caudal peduncle symmetrically marked; second suborbital leaving a considerable naked area on the cheek.

*q*. Caudal spot not continued forward, not continued on the middle caudal ray; humeral spot faint. Maxillary much shorter than the eye, with one broad 7- or 8-pointed tooth. Lateral line often interrupted, complete or incomplete. D. 11; A. 24 to 26; scales 6-32 or 33-4.5 to 5.5.

21. *inconstans* (Eigenmann).

*qq*. Caudal spot continued forward and backward usually to the tip of the middle caudal rays.

*r*. Second suborbital leaving a naked margin behind and below.

*s*. Anal rays 20 to 22. (See also *lütkeni*). Humeral spot obscure; maxillary with two, 3- to 5-pointed teeth. Depth 3; head 3.6; D. 11; scales 5-32-4.

22. *santae* (Eigenmann).

*ss*. A. 19-23. Humeral spot obscure; maxillary with two small tricuspid teeth and one conical tooth. Depth 3.5-4 equal to the head; scales 5-6 + 24-4.

23. *metae* Eigenmann and Henn.

*sss*. A. 23. Maxillary without teeth; mouth large; D. 12; scales 5-34-3. Middle caudal rays dark, a dark lateral band, no distinct caudal spot.

24. *agulha* Fowler.

*ssss*. Anal ray 20 to 26.

*t*. Maxillary with one tricuspid tooth; mouth large. Humeral spot often obscure; lower lobe of the caudal hyaline; distal third of the anal dusky. D. 11; A. 22-26; scales 6-33 to 36-5 or 6.

25. *anisitsi* (Eigenmann).

*tt*. Maxillary with two, 7- to 10-pointed teeth. Humeral spot distinct, vertically elongate, margined in front and behind with light. Caudal spot not always reaching the end of middle caudal rays. Depth 2.3 to 2.6; head 3.7 to 4.4; D. 11; A. 20 to 26; scales 5 or 6-30 to 35-4 or 5.....26. *lütkeni* (Boulenger).

- rr. Second suborbital in contact with the preopercle.
- u. Large caudal spot; humeral spot intense; lateral stripe black, linear, most intense over the middle of the anal, disappearing below the origin of the dorsal, and becoming very faint before it reaches the caudal spot. Lateral line with pores on 5 to 7 scales. Maxillary with one small 3- to 5-pointed tooth. D. 11; A. 18 to 21; scales 6 to 7-31 to 34-4 or 5....27. *reticulatus* Ellis.
- uu. Intense caudal spot; humeral spot dim and vertically elongate. Lateral stripe plainly continuous with the caudal spot. Caudal spot continued to the end of the middle caudal rays. Eye small, 3 to 3.5, interorbital 2.8-3 in the head. D. 11; A. 16 to 18; scales 5 or 6-36-4 or 5.  
28. *duragenys* Ellis.
- uuu. No caudal spot. Humeral spot faint and vertically elongate. Lateral stripe broad, continued to the end of the middle caudal rays. Eye small 4, interorbital 2-2.6 in the head. D. 11; A. 16-18; lateral line 36.....29. *poeciloides* Eigenmann.
- ii. No caudal spot, humeral spot developed, cheek partly naked. (See also *poeciloides*).
- v. Humeral spot not continued backwards.
- w. Humeral spot much nearer to the posterior margin of the eye than the dorsal.
- x. A black line along the middle of the sides. Maxillary with one or more, usually two, conical or 3-pointed teeth. Humeral spot round or oval. Mouth large; D. 11; A. 22-26; scales 5-31 to 33-3 to 3.5.  
30. *bellottii* (Steindachner).
- xx. Two vertical humeral spots, a series of v-shaped lines along the middle of the sides. Young uniformly dotted. Maxillary with one moderately large 3- to 5-pointed tooth. D. 11; A. 29 to 32; scales 6 or 7-33 to 36-5 or 6.....31. *bifasciatus* Ellis.
- xxv. Humeral spot very faint; maxillary with seven small conical teeth. A. 20; scales 5-33-3.....32. *catableptus* (Durbin).
- ww. Humeral spot round, with vertical elongations, equidistant from the posterior margin of the eye and the base of the first dorsal ray; mouth only moderately large. Maxillary with three broad, 4- to 7-pointed teeth. D. 11; A. 26 to 31; scales 6-33-4.  
33. *stictus* Durbin.
- www. Humeral spot vertical, conspicuous; maxillary with 0-3 minute teeth; A. 22-24; scales.  
34. *ecuadoriensis* Eigenmann and Henn.
- vv. Humeral spot not separable from the conspicuous lateral band.
- y. Lateral band bordered above with silvery. First six anal rays elongate. Maxillary, with four conical teeth. Origin of the anal under the last dorsal ray. D. 11; A. 20-23; scales 5-32 to 34-8. Eye 2.5 in the head.  
35. *heterorhabdus* (Ulrey).

yy. Lateral band not bordered above with silvery. Origin of the anal on the vertical from the third dorsal ray. D. 11; A. 26 to 28; scales 6 or 7-30 to 36-5.  
36. *melanopleurus* Ellis.

# 1. HYPHESSOBRYCON COMPRESSUS (Meek).

Plate 24, fig. 1; Plate 79, fig. 14.

*Hemigrammus compressus* MEEK, Field Columbian mus. Publication, 1904, Zool. ser. 5, p. 87 (El Hule, Oaxaca in basin of Papalvani).

*Hyphessobrycon compressus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Mexico.

## Specimens examined.

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10798, 11126 I.	7	36-42	Obispo, Vera Cruz, Mex.	Meek
10929 I.	1	44	Perez, Mex.	Meek

Head 3.5-3.7; depth 2.5-2.7; D. 11; A. 25-27; scales 8-45 to 48-7; eye 2.5 or a little more in the head; interorbital 3 to 3.5 in the head, much less than the eye.

Compressed, comparatively deep; depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral region rounded, without regular median series of scales. Predorsal region slightly keeled, a regular series of about 18 narrow median scales.

Occipital process 5 in the distance between its base and the dorsal, bordered by about 5 scales. Interorbital very slightly convex. Frontal fontanel triangular, narrower than and almost as long as the parietal without the occipital groove. Second suborbital small, leaving a naked area behind and below as wide as the bone. Maxillary equal to the eye; mandible 1.25 to 1.3 times the eye. Snout short, 2 in the length of the eye. Mouth large; premaxillary with five tricuspid teeth in the inner, and two or three tricuspid teeth in the outer row; the two rows close together. Maxillary with four to seven conical or tricuspid teeth placed far apart. Dentary with a graduated series of five tricuspid teeth followed by a series of minute conical ones on the sides of the jaw.

Gill-rakers 12 + 7, the longest nearly half the length of the eye.

Scales small and narrow. Imbrication usually regular, in one instance a row of scales dropped out above the middle of the ventrals. Anal sheath short, consisting of 5 to 8 scales, and covering the base of the first 5 or 6 rays. Lateral line developed on 6 scales.

Origin of the dorsal nearly the length of the eye nearer to the caudal than to the snout, the penultimate ray 2.5 in the longest which is 4 in the length. Anal origin on the vertical from the fifth or sixth dorsal ray. Anal emarginate. Caudal equal to the head in length. Ventrals on the vertical half the length of the dorsal basis in front of origin of dorsal. Ventrals reaching the base of the fifth anal ray; pectorals reaching to third scale beyond origin of the ventrals.

A triangular black spot covering all but the extreme base of the proximal half of the anterior six or seven dorsal rays, widest anteriorly. Membranes especially at the tip of anal with numerous chromatophores, chromatophores scattered sparingly over all the fins and sides excepting the part over the body-cavity. No humeral or caudal spot. Preopercle with some silvery iridescence.

## 2. HYPHESSOBRYCON MILLERI Durbin.

Plate 24, fig. 2.

*Hemigrammus compressus* MILLER, Bull. Amer. mus. nat. hist., 1907, 23, p. 101 (Los Amates).

*Hyphessobrycon compressus milleri* DURBIN, Bull. M. C. Z., 1908, 52, p. 100; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Guatemala.

One specimen 11255 I. Type      40 mm.      Los Amates, Guatemala      Miller

Very closely related to *H. compressus* from which it may be distinguished by having the entire dorsal dark. Anal membranes except, in the anal lobe, black. Opercle deeply incised behind, maxillary less than the eye; naked margin around the second suborbital not more than half the width of the bone.

Head 3.25; depth 2.5; D. 11; A. 25; scales 8–45 to 48–7, eye 3 in the head, interorbital equal to the eye, 3 in the head.

Like *H. compressus* in shape and scaling of preventral, postventral, and predorsal regions, relative length and size of occipital process, frontal, and parietal fontanel. Interorbital slightly more convex. Second suborbital small, about half as wide as the eye, but more than twice as wide as its naked margins. Opercle deeply incised behind. Maxillary shorter than the eye; mandible 1.2 times the eye. Snout a little less than half the eye. Teeth as in *H. compressus*.

Gill-rakers 9 + 10, slender, serrate on one side only.

Scales not different from those of *H. compressus*, except that the lateral line is very slightly decurved.

Origin of the dorsal as in the related species but origin of the anal on the vertical from the third instead of the fifth dorsal ray.

Entire dorsal dark, anal web, except in the anal lobe, black; some large black chromatophores on the anal rays. The sides everywhere thickly peppered with conspicuous chromatophores; especially dusky about the origins of the anal and ventrals. The scales in the upper half of the region above the anal more or less distinctly outlined. Preopercle and second suborbital with brassy reflections which are less evident on the scales of the body.

### 3. *HYPHESSOBRYCON CALLISTUS* (Boulenger).

Plate 24, fig. 3; Plate 79, fig. 13.

*Tetragonopterus callistus* BOULENGER, Boll. Mus. univ. Torino, 1900, 15, no. 370, p. 2 (Carandosinho, Matto Grosso).

*Hemigrammus melanopterus* EIGENMANN and KENNEDY, Proc. Acad. nat. sci. Phil., 1903, p. 518 (Arroyos Trementina and Pypucu, Paraguay).

*Hyphessobrycon callistus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 158.

HABITAT.—Paraguay Basin in Matto Grosso and Paraguay.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10039 I. <sup>1</sup>	1	33 (about)	Arroyo Trementina	Anisits
10040 I. <sup>2</sup>	1	33 (about)	Arroyo Pypucu	Anisits
10041 <sup>2</sup>	1	28 (about)	Arroyo Pypucu	Anisits
3039 C.	8	26–38	Caceres	Haseman
3040 C.	14	33–38	Puerto Suarez	Haseman
3037 C.	4	31–39 (about)	Corumba	Haseman
3038 C.	6	25–38 (about)	Jauru	Haseman

Head 3.2–3.6; depth 2.33–3; D. 10 or 11; A. 27 to 30; scales 6 to 7.5–5 + 31 to 33–3.5; eye 2.25 to 2.66 in head, interorbital 3.5 in the head.

Compressed, deep; depth of head at the base of the occipital process 2, or little less, in the greatest depth. Dorsal profile much arched to the origin of the dorsal. Dorsal base steeply inclined toward the caudal. Preventral region rounded, no regular median series of scales. Predorsal region rounded, with a regular median series of 11 scales.

<sup>1</sup> Type of *H. melanopterus* Eigenmann & Kennedy.

<sup>2</sup> Paratypes of *H. melanopterus* Eigenmann & Kennedy.

Occipital process 4 to 5 in the distance from its base to the dorsal; bordered by two and five tenths to three scales. Interorbital almost flat. Frontal fontanel much narrower than the parietal, two thirds as long as the parietal without the occipital groove. Second suborbital broad, in contact with the preopercle at its middle and below, leaving a narrow naked margin behind it, third suborbital narrow, inconspicuous. Mouth small; snout short. Maxillary shorter than the eye, mandible a little longer. Premaxillary with five, 3- and 4-pointed teeth in the inner row; two tricuspid teeth in the outer row. Maxillary with two or three small tricuspid teeth placed close together. Dentary with a graduated series of five large 3- to 5-pointed teeth followed by five or six minute conical ones on the sides.

Gill-rakers 7 + 11.

Anal sheath short, of about 6 scales, covering the bases of the first 5 rays. Lateral line developed on 5 scales.

Origin of the dorsal equidistant from the snout and caudal, penultimate ray 2 in the longest ray, which is 3.5 in the length. Origin of the anal on the vertical from the fifth or sixth dorsal rays. Anal long and wide, the rays of nearly the same length throughout. Origin of ventrals on the vertical from the third or fourth scale in front of the dorsal. Ventrals reaching to or beyond the origin of the anal, pectoral barely reaching the ventrals.

Entire dorsal black, with never more than the narrow base and extreme tips of rays whitish. One half to one fifth of the anterior seven anal rays, the tips of all the middle ones and almost the entire last five rays black. A heavy black vertically elongate humeral spot crossing the fourth, fifth, and sixth scales of the lateral line series. No caudal spot. Scales of the dorsal surface outlined with dusky.

In the type of *H. melanopterus* the ventrals reach considerably beyond the origin of the anal, and the anal is more conspicuously marked with black than in the other specimens.

#### 4. *HYPHESSOBRYCON MINOR* Durbin.

Plate 22, fig. 3.

*Hyphessobrycon minor* DURBIN, Ann. Carnegie mus., 1909, 6, p. 65 (British Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus. 1912, 5, p. 339, pl. 49, fig. 5.

HABITAT.—British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1189 C. Type	1	19	Konawaruk	Eigenmann
11767 I. Paratypes	2	21-25	Konawaruk	Eigenmann
3075 C.	1	25	Demerara river	Eigenmann

Head 3.5; depth 3.8; D.11; A. 26 to 28; scales 5-32 to 34-3; eye 2.5 in head; interorbital less than the eye, about 3 in the head.

Compressed; depth of head at base of the occipital process 1.25 in the greatest depth. Preventral region rounded, with complete median series of 10 to 11 scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process about 5 in the distance from its base to the dorsal, bordered by two scales. Interorbital slightly convex. Frontal fontanel triangular, narrower than the parietal, three fourths the length of the parietal fontanel without the occipital groove. Second suborbital leaving narrow naked margins behind and below, the lower margin being a mere line. Snout short, 1.5 in the length of the eye. Mouth small. Maxillary less than the eye, about 3 in the head; mandible equal to the eye, about 2.5 in the head. Premaxillary with one or two narrow tricuspid teeth in the outer row and five 3- to 5-pointed teeth in the inner row. Maxillary with two or three broad 3- to 5-pointed teeth. Dentary with four or five 3- to 5-pointed teeth in a graduated series, followed by several minute conical or 3-pointed teeth on the sides.

Anal sheath short, of 5 scales covering the base of the first 8 or 9 rays. Lateral line with pores developed on 7 scales.

Origin of the dorsals equidistant from the snout and caudal; penultimate ray little more than one third the longest which is 3.8 in the length. Origin of the anal on the vertical from the fourth dorsal ray. Anal emarginate, the longest ray 2 in the length of the base. Ventrals on the vertical from the first or second scales in front of the dorsal. Ventrals reaching the third anal ray; pectorals reaching just beyond the base of the ventrals.

Humeral spot small, black, vertically elongate. No caudal spot. Lateral stripe extremely narrow and line-like, interrupted and very faint. Scales of the back and upper half of the sides outlined with dusky. Dorsal with an intense black bar on the outer half of the anterior six or seven rays; the tips of the second, third, and fourth rays and a streak directly below the black bar, white. Posterior half of anal rays with blackish tips. Caudal, anal, ventrals, and pectorals a little dusky.



5. *HYPHESSOBRYCON SERPAE* Durbin.

Plate 25, fig. 1; Plate 79, fig. 12, 12a, 12b.

*Hyphessobrycon serpae* DURBIN, Bull. M. C. Z., 1908, 52, p. 100 (Serpa); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159.

HABITAT.—Amazon, Rio Guaporé, Upper Paraguay.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20985 Cotypes	46	26–30	Serpa	Thayer
3086 C.	2	27–42	Maciél, Rio Guaporé	Haseman
3087 C.	1	23	Caceres	Haseman

Head 3.5; depth 2.75–3; D. 10 or 11; A. 25–30; scales 5–29 to 31–3.5; eye 2.5–2.75; interorbital 3 in head.

Body compressed, deepest at the origin of the dorsal. Depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded in front, flattish near the ventrals, without a regular series of median scales. Predorsal region rounded, very slightly if at all keeled, with a median series of 10 scales.

Occipital process 5 in the distance from its base to the origin of the dorsal, bordered by 3–3.67 scales. Interorbital slightly convex. Frontal fontanel narrowly triangular, 1.25 in the much wider parietal, without the occipital groove. Second suborbital in contact with the preopercle below, a narrow naked border behind it, second suborbital narrow. Mouth moderately large. Maxillary almost equal to the length of the eye. Mandible a very little longer than the eye. Snout short. Premaxillary with two or three tricuspid teeth in an outer row and five to seven 3- to 4-pointed ones in the inner row. Maxillary with two, sometimes three, small tricuspid teeth. Dentary with a graduated series of five 3- to 5-pointed and five or six minute conical teeth on the side.

Gill-rakers 7 + 16.

Anal sheath short, consisting of 4 or 5 scales covering the bases of the first 8 or 9 anal rays. Pores on 5 or 6 scales of the lateral line.

Origin of dorsal half the width of the eye nearer to the snout than to the base of the caudal, penultimate ray half as long as the longest which is 4 in the

length. Caudal not so long as the head. Origin of anal on the vertical from the 5th to 8th dorsal ray; anal rather narrow. Ventrals just reaching to anal. Pectorals just reaching ventrals.

A round black spot of variable size on the dorsal, bounded above with the white tips of the second and third rays and below by a narrow white bar that is widest on the first ray, coming to a point on the fourth, fifth, or sixth rays. The black may extend over all of the rays or only the first five. A submarginal bar of black on the first anal rays, a marginal black bar on the last rays; occasional specimens have the intermediate rays also tipped with black. A slender narrowly diamond-shaped humeral spot, more distinct on small than on large specimens. No caudal spot. Caudal lobes tipped with dusky. Scales of the back outlined with dusky.

#### 6. *HYPHESSOBRYCON COPELANDI* Durbin.

Plate 25, fig. 2; Plate 79, fig. 11, 11a, 11b.

*Hyphessobrycon copelandi* DUBIN, Bull. M. C. Z., 1908, 52, p. 101 (Tabatinga); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Upper Amazon.

One hundred specimens, 20771 Cotypes      29–42 mm.      Tabatinga      Bourget

Head 3.5 to 3.8; depth 3 to 3.2; D. 11; A. 28; scales 5 to 7–24 to 27–3.5; eye 2.25 to 2.3; interorbital 2.8 to 3 in the head.

Compressed; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region flat, a large scale just in front of the ventrals occupying the entire space between them; an irregular median series of 10 scales. Predorsal region narrowly rounded, with complete median series of 8 or 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2.5 to 3 scales. Interorbital very slightly convex. Frontal fontanel triangular, narrower than and two thirds as long as the parietal, without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below. Maxillary about 1.33 in the length of the eye. Mandible equal to the eye. Snout short. Premaxillary with two or three 3- to 5-pointed teeth near the center of the outer row, the first falling between the first and second teeth of the second series, and the second between the second and third of second series. The inner series of five 5- to 7-pointed teeth. Maxillary

with two or three teeth of from 7 to 9 cusps each. Dentary with a graduated series of about ten teeth, the five in front with 5 to 7 cusps, those on the sides tricuspid.

Gill-rakers about 6 + 10.

Anal sheath represented by 6 scales diminishing in size from the anterior two. Lateral line with pores on 5 to 9 scales.

Origin of the dorsal equidistant from the snout and the last anal ray or tip of the adipose; the penultimate ray almost half as long as the longest, which is 4.16 to 4.25 in the length. Caudal a little longer than the head. First anal ray on the vertical from the fourth to eighth dorsal ray. Ventrals directly below the second scale in front of the dorsal. Pectorals reaching the ventrals.

First six dorsal rays tipped with chalky white their submarginal half covered with a black bar; another bar of chalky white covering one half or two thirds of the remaining distance to the base of the rays; anal usually plain, sometimes tips of the second, third, and fourth anal rays white, a black line passing from just proximal of the white to the tips of fifth and sixth rays. The tips of all the other anal rays touched with black which deepens a little upon the last rays. A vertical humeral spot crossing the third and fourth, sometimes the fourth and fifth scales of the lateral line; margin of caudal dusky; sides, excepting over the body-cavity, with chromatophores. Outer rays of the ventrals and pectorals chalky white.

#### 7. *HYPHESSOBRYCON BENTOSI* Durbin.

Plate 25, fig. 3; Plate 79, fig. 9, 9a.

*Hyphessobrycon bentosi* DURBIN, Bull. M. C. Z., 1908, 52, p. 101 (Obidos); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

HABITAT.—Amazon.

Twenty-one specimens 20842 Cotypes    30–38 mm.    Obidos    Bentos

Head 3.3 to 3.5; depth 2.8–3.2; D. 11; A. 27–30; scales about 30–33; eye 2.5 in head; interorbital much less than the eye.

Compressed; depth of the head at the base of the occipital process 1.33 to 1.5 in the greatest depth. Preventral region rounded. Predorsal region slightly keeled.

Occipital process 5 in the distance from its base to the origin of the dorsal.

Interorbital flat. Frontal fontanel small, triangular, and two thirds the length of the parietal without the occipital groove. Second suborbital in contact with the preopercle below, having a narrow naked line behind; third suborbital narrow. Maxillary equal to the eye; mandible a little longer than the eye, a little more than two times in the head. Snout short. Premaxillary with two or three conical teeth in the outer row, and eight teeth, the first four always tricuspid, and the rest either tricuspid or conical, in the inner row. Maxillary with from four to eight, usually six, conical or narrowly three-pointed teeth. Dentary with five, rarely four, 3- to 5-pointed teeth; eight to thirteen minute conical ones on the side.

Gill-rakers  $8 + 14$ , long and slender.

Scales are mostly lost in the specimens.

The origin of the dorsal the length of the eye nearer to the snout than to the base of the caudal; the penultimate ray about 2.33 in the longest, which is 3.5 in the length. Caudal equals the length of the head. Anal somewhat emarginate, its origin on the vertical from the sixth dorsal ray; penultimate ray 3 in the longest which is 3.75 in the length. Ventrals on a vertical half the length of the eye, or a little more, in front of the dorsal, and reaching to the third anal ray. Pectorals overlapping a third of the ventrals.

A round black spot on the distal half of the second to sixth dorsal rays; the first, second, and third rays tipped with white, a white bar bounding the lower margin of the spot and covering the outer half of the proximal half of the marked rays, the basal fourth and other five rays hyaline. Anal, caudal, and other fins a little dusky. Upper scales margined with dusky. A very indistinct broad lateral band passing from the indistinct, or almost obsolete, brown humeral spot to the caudal peduncle. No caudal spot.

#### 8. *HYPHESSOBRYCON ROSACEUS* Durbin.

Plate 23, fig. 5.

*Hyphessobrycon rosaceus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 67 (Gluck Island and Rockstone, Brit. Guiana); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 339, pl. 2, fig. 1; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159.

HABITAT.—British Guiana, Guaporé Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1190 C. Type	1	35	Gluck Island	Eigenmann
1191 C., 11768 I. Paratypes	25	19-38	Gluck Island	Eigenmann
1192 C. Paratype	1	34	Rockstone	Eigenmann
3078 C.	2	24-34	Bastos	Haseman

Head 3.33-3.67; depth 2.75; D. 11; A. 26 or 27; scales 5-31 to 33-3; eye 2.5 in head; interorbital almost equal to the eye, 2.6 in the head.

Compressed; depth of head at base of occipital process 1.5 in the greatest depth. Preventral regions without complete series of median scales. Predorsal region rounded, without complete series of median scales, slightly keeled.

Occipital process about 5 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital somewhat convex; frontal fontanel triangular, as wide as the parietal and almost equal to the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below; third suborbital very small. Maxillary equal to the eye. Mandible longer than the eye, 2+ in the head. Snout short, mouth large. Premaxillary with two or three narrow tricuspid teeth in the outer row and six to eight small tricuspid and conical teeth in the inner row. The two rows of premaxillary teeth not so far apart as in most species of the genus. Maxillary with four to six very small narrowly tricuspid or conical teeth. Dentary with a graduated series of five 3- to 5-pointed teeth followed by about eight minute teeth on the sides.

Gill-rakers 8 + 12.

Anal sheath short, composed of 4 or 5 scales covering the base of the first 7 or 8 anal rays. Lateral line with pores developed on 6 or 7 scales.

Origin of dorsal about half the length of the eye nearer to the snout than to the caudal, the penultimate ray almost one third of the longest which is 3 to 3.5 in the length. Caudal equal to the head. Origin of the anal on vertical from the middle dorsal ray; anal emarginate, the longest ray 1.5-2 in the base, rays very close together. Ventrals on the vertical from the first scale in front of the dorsal. Ventrals just reaching the first or second anal rays. Pectorals reaching a little beyond the base of the ventrals.

Humeral and caudal spots lacking. Scales of the back outlined with dusky. The entire sides, except over the body-cavity, with scattered chromatophores

which are a little thicker on the caudal peduncle and on the third and fourth scales of the lateral line and the 3 scales above them. The chromatophores are thinner over a small vertically elongate area immediately behind the humeral area just described. The lateral stripe very slender extending entirely to the caudal. Dorsal with a round intensely black spot on the first seven rays, the tips of the second and third rays white. The distal half of the longest anal ray and the tip of the next ray also white. All the fin-rays dusky. Scales on the sides with a pale blue iridescence in life. Rosy tinged, especially above anal, base of caudal lobes, and ventrals. Anal lobe and base and tip of dorsal lobe bright orange.

#### 9. *HYPHESSOBRYCON HASEMANI* Fowler.

*Hyphessobrycon hasemani* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 545, fig. 13 (Madeira River, above the Falls of Guajaramirim, approximately in Lat. S. 10° 47', Long. W. 65° 23').

This species is known only from the type, a specimen 28 mm. long, collected by E. A. Smith.

Head 3.25; depth 3.125; D. 10; A. 30; scales 32, 10 scales between dorsal and ventral; 11 predorsal scales; snout 4.25; eye 3.6; interorbital 3.5 in the head. No maxillary teeth; suborbitals completely covering cheeks.

No humeral or caudal spot, a black spot slightly above the middle of the first seven dorsal rays.

#### 10. *HYPHESSOBRYCON PANAMENSIS* Durbin.

Plate 26, fig. 1; Plate 33, fig. 4.

*Hyphessobrycon panamensis* DURBIN, Bull. M. C. Z., 1908, 52, p. 101 (Boqueron River, Panama); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436.

*Hemigrammus minutus* MEEK & HILDEBRAND, Field mus. Publication, 1912, Zool. ser., 10, p. 67 (Rio Agua Clara, Panama Canal Zone).

HABITAT.—Panama and Colombia.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector	
20688	} Cotypes	1	31	Panama	Hassler Exped.
20688		6	29–32	Panama	Hassler Exped.
— U. S. N. M.	1	32	Boqueron River, Panama	Busck	

In addition to these on which the description is based, I have series of specimens from the Patia, San Juan, Atrato, and Magdalena Basins.

Head 3.25 to 4; depth 2.75 to 2.8; D. 11; A. 23-25; scales 7-34 to 36-6; eye 2.1-2.4, in the head; interorbital less than the eye, 3 in the head.

Very compressed; dorsal profile about equally arched with the ventral profile. Preventral region rounded, without a complete series of median scales. Predorsal region obscurely keeled, with a median series of 10 to 13 scales.

Occipital process little more than 4 in the distance from its base to the dorsal, bordered by 3 or 4 scales. Interorbital slightly convex. Frontal fontanel elongate, triangular, narrower than the parietal, as long as the parietal without the occipital groove. Second suborbital leaving a very narrow naked margin around its entire edge. Snout short, about 2 in the eye; mouth large. Maxillary slender, its anterior margin nearly straight to near the posterior angle where it is rounded, a little less than the eye, about 2.67 in the head. Mandible considerably longer than the eye, 2 in the head. Premaxillary with an outer row of three tricuspid teeth and an inner row of five 3- to 5-pointed teeth. Maxillary with three tricuspid or conical teeth. Dentary with four large teeth and a series of about seven abruptly smaller teeth on the side.

Gill-rakers 7 + 11.

Anal sheath short, with about 7 scales covering the base of the first 7 or 8 anal rays. Lateral line with pores developed on 9 to 13 scales.<sup>1</sup>

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray two fifths of the longest, which is 3.25 in the length. Caudal about half the length of the eye shorter than the head. Origin of the anal on the vertical from the eighth or ninth dorsal ray. Anal long, somewhat emarginate, the longest ray about 1.5 in the base. Base of ventrals on the vertical from the first scale in front of the dorsal. Ventrals reaching the second or third anal ray. Pectorals reaching the first or second scale beyond the base of ventrals.

No humeral spot, no caudal spot. A few of the anal rays sometimes tipped with black, the other fins unmarked with black. Scales of the back and upper half of the sides broadly outlined with dusky. A very narrow lateral stripe. Numerous inconspicuous chromatophores everywhere on the body except over the body-cavity and a small area just behind the humeral region. A pale blue iridescence on the cheek and sides below the lateral stripe.

<sup>1</sup> In at least some of the Pacific slope specimens the line approaches completeness.

11. *HYPHESSOBRYCON GRACILIS* (Reinhardt).

Plate 22, fig. 4; Plate 26, fig. 2; Plate 79, fig. 7.

*Tetragonopterus gracilis* REINHARDT in Lütken, Overs. K. Dan. selsk. Forh., 1874, p. 133 (Lagoa Santa); LÜTKEN, Velhas-Flodens fiske, 1875, p. 217, pl. 5, fig. 16, (Rio das Velhas); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 286; Boulenger, Boll. Mus. univ. Torino, 1895, 10, no. 196, p. 3 (Villa Rica).

*Hemigrammus gracilis* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 38, p. 15 (Lagoa Santa); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 340, pl. 44, fig. 4.

*Tetragonopterus schmardae* ULREY, (non Steindachner), Ann. N. Y. acad. sci., 1895, 8, p. 286 (Para).

HABITAT.—San Francisco, Paraguay, Amazon Basin, and British Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Length in mm.	Locality	Collector
21008	1977	24-30	Brazil	Justa
5176 I.	4	20-24	Para, Brazil	Hartt
5177 I.	1	27	Lower Amazon	Hartt
20812	1	44	Iça	James
1247 C., 11772 I.	16	19-24	Gluck Island	Eigenmann

Head 3-3.5; depth 3-3.5; D. 10, occasionally 11; A. 17-24<sup>1</sup>; scales 5-29 to 34-3.5 or 4; 6 to 13 pores in the lateral line; eye 2-2.5 in the head; interorbital little less than the eye, 2.7-3 in the head.

Compressed; head short, depth of head at the base of the occipital process 1.5 to 1.25 in the greatest depth. Preventral region rounded, with a regular median series of 9 to 12 scales. Predorsal region rounded, not keeled, with a regular median series of 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2 to 2.5 scales. Interorbital slightly convex. Frontal fontanel triangular, narrow, and equal to the length of the parietal without the occipital groove. Second suborbital leaving a naked border about one third of its own width; third suborbital small. Maxillary not quite equal to the length of the eye. Mandible a little longer than the eye. Snout short. Premaxillary with five 3- to 5-pointed teeth in the inner row, and two to four tricuspid teeth in the outer row. Maxillary with one to three very small tricuspid or conical teeth that are usually very difficult to see. Dentary with four, less frequently five

<sup>1</sup> The anal in No. 21008 varies from 17-20, in 5176 from 22-24, in 2812 there are 24, and in 5177 there are 21 anal rays.



4- to 5-pointed teeth in a graduated series, the last followed by seven or eight minute conical teeth.

Gill-rakers 7 or 8 + 12.

Anal sheath short, consisting of 3 or 4 scales and covering the bases of the first 7 rays. Lateral line with pores on 6 to 13 scales; four specimens in 21008 have lateral line complete.

Origin of the dorsal equidistant from the snout and caudal, the penultimate ray one third of the longest which is 4 in the length. Caudal equal to the length of the head *plus* the length of the eye. Origin of the anal on the vertical from the last dorsal ray; anal emarginate. Origin of the ventrals on the vertical from the first or second scale in front of the dorsal. Ventrals just reaching the anal; pectoral lapping a little onto the ventrals.

All of the fins hyaline except an occasional dim spot at the base of the caudal which never reaches the end of the caudal rays. A distinct silver lateral stripe subtending a very inconspicuous, narrow brown or black stripe. The scales of the lateral line and the series above and below it have iridescence. The scales over the body-cavity have a less pronounced blue iridescence.

## 12. *HYPHESSOBRYCON RIDDLEI* (Meek).

Plate 26, fig. 3; Plate 79, fig. 6, 14a.

*Hemigrammus riddlei* MEEK MS. EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 13 (Los Castillas).  
*Hyphessobrycon riddlei* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 340.

One specimen Type Field Museum 38 mm. Los Castillas Riddle

Head 3.85; depth 2.66; D. 10; A. 19; scales 5-32 to 34-3.5; eye and interorbital equal, 2.9 in the head.

Compressed; depth of head at the base of the occipital process 4.75 in the depth. Preventral region rounded, without regular and complete series of median scales. Predorsal region rounded, with complete median series of 10 scales.

Occipital process 7 in the distance between its base and the dorsal, bordered by 2.5 to 3 scales. Interorbital very slightly convex. Frontal fontanel triangular, very small, narrower than the parietal, and half the length of the parietal without the occipital groove. Second suborbital in contact with the preopercle. Mouth small. Maxillary very little shorter than the eye, 3 in the head. Mandible 2.1 in the head. Premaxillary with about ten very small

tricuspid teeth in the inner row and two conical or tricuspid ones in the outer row. Maxillary with four small conical and 3-pointed teeth. Dentary with a graduated series of about eight very small tricuspid teeth followed by four minute conical ones.

Gill-rakers 8 + 14.

Anal sheath probably obsolete. Lateral line with pores on about the first half of the scales.

Origin of the dorsal equidistant from the snout and the caudal, its penultimate ray 2.33 in the longest which is 3.33 in the length. Origin of the anal on the vertical from the first scale behind the dorsal. Anal slightly falcate. Base of ventrals on the vertical from the second scale in front of the dorsal. Ventrals barely reaching to the anal. Pectorals not reaching the ventrals by half the width of the eye.

A small black spot at the base of each caudal lobe. No humeral spot or lateral stripe. Scales of the dorsal surface and basis of the anal rays outlined with dusky. Fins all a little dusky.

A single specimen, 1248 C. M., 23 mm. from Rockstone, probably *H. riddlei* or very near it, differs as follows from the type of *H. riddlei* from Los Castillas. Dorsal profile straight. Maxillary with six conical teeth, premaxillary with twelve small teeth in the inner row and two in the outer. Depth 3.8; eye 3 in the head; D. 11; A. 20; scales 4-31-3.

### 13. HYPHESSOBRYCON STRAMINEUS Durbin.

*Hyphessobrycon stramineus* DURBIN MS. EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436 (Tabatinga).

One specimen 20772 Type 38 mm. Tabatinga Bourget

Head 4; depth 2.8; D. 10; A. 27; scales 5-32-3; eye 2.7 in the head, interorbital just equal to the eye.

Compressed; depth of head at the base of the occipital process 1.75 in the greatest depth. Preventral and predorsal regions rounded, without complete regular series of median scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 2+ scales. Interorbital slightly convex. Frontal fontanel small, triangular, narrower than the parietals, little more than one half the parietal without the occipital groove. Second suborbital in contact with the preopercle. Snout shorter than the eye, mouth comparatively small. Maxillary about equal to

the eye; mandible equal to the eye, 2.7 in the head. Premaxillary with two conical teeth in the outer row and nine tricuspid teeth in the inner row. Maxillary without teeth. Dentary with a graduated series of about nine tricuspid teeth.

Gill-rakers 7 + 9.

Anal sheath probably short or lacking. Lateral line with pores developed on the first 7 scales.

Origin of the dorsal one half the length of the eye nearer to the caudal than to the snout, penultimate ray one third the longest which is 3.67 in the length. Caudal longer than the head. Origin of the anal on the vertical from the seventh dorsal ray. Anal emarginate, rays fine and close together, longest ray 1.8 in the base of the fin. Ventrals on the vertical from the second or third scale in front of the dorsal; ventrals not quite reaching the anal. Pectorals barely reaching the ventrals.

Caudal spot intense and round, not continued on the middle caudal rays. No humeral spot. Lateral stripe silvery, without dark pigment. Fins all hyaline. Suborbitals and the scales over the lateral stripe silvery iridescent. The specimen may be badly faded, as even the usual dusky coloration on the back is lacking.

#### 14. *HYPHESSOBRYCON TAUROCEPHALUS* Ellis.

Plate 29, fig. 3.

*Hyphessobrycon taurocephalus* ELLIS, Ann. Carnegie mus., 1912, 8, p. 151, pl. 1, fig. 4 (Serrinha Parana).

HABITAT.—Upper Iguassú.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3007 C. Type	1	55	Serrinha Parana, Rio Iguassú	Haseman
3008 C. Paratypes	32	30-46	Serrinha Parana, Rio Iguassú	Haseman
3009 C. Paratypes	22	30-45	Porto Uniao, Rio Iguassú	Haseman
3010 C. Paratypes	13	27-36	Porto Uniao, Rio Iguassú	Haseman

Head 3.8-4; depth 3; D. 11; A. 14 to 16; scales 5 or 6-32 to 36-4 to 5. Eye 3 to 3.25; interorbital much wider than the eye, 2.2 in the head.

Little compressed, depth of the head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded.

Occipital process a little more than 4 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Frontal fontanel triangular, as wide as the parietal, two thirds of the parietal without the occipital groove. Second sub-orbital leaving a narrow naked margin behind and below. Maxillary margin very convex, the proximal third much constricted, very short, 1.5 in the eye or nearly 5 in the head; mandible short, equal to the eye, about 3 in the head. Mouth moderately large; snout very short, equal to the maxillary. Premaxillary with three 3- to 5-pointed teeth in the outer row, and five broad 5- to 7-pointed teeth in the inner row; the last of the inner series is often much reduced. Maxillary without teeth. Dentary with graduated series of four or five 5- to 7-pointed teeth followed by one or two small notched teeth on the sides.

Gill-rakers 7 + 10.

Anal sheath rudimentary. Lateral line with pores developed on 5 to 9 scales.

Origin of the dorsal the length of the eye nearer to the caudal than to the snout, the longest ray 4.6-5 in the length. Caudal equal to the head. Origin of the anal on the vertical from the second or third scale behind the dorsal. Anal emarginate, the longest rays almost equal to the anal base which about equals the head without the preopercle. Anal armature developed on the first six or seven rays. Ventrals on the vertical from the first or second scale in front of the dorsal, reaching the first, second, or third scale in front of the anal. Pectorals reaching the second or third scale in front of the ventrals.

Humeral spot lacking. Caudal spot sharply constricted behind and continued to the end of the middle caudal rays, continued forward as a heavy lateral stripe which often reaches the upper angle of the preopercle. The lateral stripe overlaid with a dull silvery. Dorsal, caudal, pectorals, and first five anal rays dusky. Scales of the back outlined with dusky. Bluish iridescence on the sides over and below the lateral stripe.

#### 15. *HYPHESSOBRYCON PARVELLUS* Ellis.

Plate 29, fig. 1.

*Hypheessobrycon parvellus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 153, pl. 2, fig. 1.

HABITAT.—Southeastern Brazil.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
3011 C. Type	1	30	Alagoinhas, Rio Catu	Haseman
3012 C. Paratypes	3	20-30	Alagoinhas, Rio Catu	Haseman
3013 C. Paratype	1	22	?	Haseman
2932 C. Paratypes	7	13-29	Rio Itapicurú, Queimadas	Haseman
3014 C. Paratype	1	17	Agua Quente	Haseman
2930 C. Paratype	1	18	Riberão, Azul Lagoa	Haseman
2931 C. Paratype	1	12	Rio Tieté	Haseman

Head 3.5; depth 2.75; D. 11; A. 20 or 21; scales 5-32 to 34-3 to 4. Eye 2.3 in the head; interorbital less than the eye, about 2.7 in the head.

Compressed, depth of head at the base of the occipital process 1.25 in the greatest depth. Occipital process bordered by 2.5 scales. Interorbital convex. Frontal fontanel triangular, very small. Second suborbital leaving a narrow naked margin behind and below. Mouth rather small; snout very short, about 1.66 in the eye. Maxillary less than the eye, 2.6 in the head. Mandible equal to the eye. Premaxillary with three or four narrow, conical teeth in the outer row, and five or six tricuspid teeth in the inner row. Maxillary with, or without, one small, conical tooth. Dentary with a graduated series of four tricuspid teeth followed by three conical ones on the side.

Gill-rakers 11 + 9, short and strong.

Anal sheath composed of 6 scales covering the base of the first 10 rays. Lateral line with pores developed on the first 6 to 8 scales.

Origin of the dorsal equidistant from the snout and the caudal. Longest dorsal ray 3.5 in the length. Caudal a little longer than the head. Origin of the anal on the vertical from the last dorsal ray. Anal usually emarginate. Ventrals on the vertical from the first scale in front of the dorsal, ventrals just reaching the anal. Pectorals just reaching the ventrals.

No humeral spot. Caudal spot either diffuse or condensed. Lateral stripe narrow, faint, overlaid with silvery. Anal often with a dark margin. Longest anal and dorsal rays tipped with white. Sides, exclusive of region over body-cavity with numerous chromatophores.

16. *HYPHESSOBRYCON MINIMUS* Durbin.

Plate 22, fig. 6.

*Hyphessobrycon minimus* DURBIN, Ann. Carnegie mus., 1909, 6, p. 68 (Cane Grove Corner, British Guiana; EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 436; Mem. Carnegie mus., 1912, 5, p. 341, pl. 49, fig. 2.

HABITAT.—Guiana.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1193 C. Type	1	18	Cane Grove Corner	Eigenmann
11769 I. Paratypes	4	16-21	Cane Grove Corner	Eigenmann

Head 3.33 to 3.67; depth 3.5 to 3.75; D. 11; A. 16 or 17; scales 5-30 to 33-3; eye 2+ in head, snout less than the eye, interorbital less than eye, about 3 in the head.

Compressed, depth of head at base of the occipital process five sixths of or equal to the greatest depth. Preventral region rounded, without regular complete series of median scales. Predorsal region rounded, with a regular series of 9 or 10 median scales.

Occipital process short, bordered by 1 to 1.5 scales. Frontal fontanels much narrower than the parietal, about three fourths the length of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short, about 2 in the length of the eye; mouth moderately large. Maxillary less than the eye, 2.75 in the head. Mandible a little more than 2 in the head. Premaxillary with two, rarely three, small tricuspid teeth in the outer row, and five broad, 5- to 7-pointed teeth in the inner row, the tooth at the median end of the inner row of each premaxillary fitting together so that the two apparently form a very large median tooth. Maxillary with two or three broad 5- and 7-pointed teeth. Dentary with four large 7-pointed teeth followed on the sides by one or two minute tricuspid teeth.

Anal sheath of 3 scales covering the base of the first 5 or 6 rays. Lateral line with pores developed on 5 to 8 scales.

Origin of the dorsal equidistant from the snout and caudal, its longest ray 3.5 in the length. Origin of anal on the vertical from the last 2 or 3 dorsal rays. Anal emarginate, the longest ray 1.5 in the base. Ventrals on the vertical from the second dorsal ray. Ventrals just reaching the anal. Pectorals just reaching the ventrals.

Caudal spot intense black, roundish and scarcely if at all continued on the caudal rays. Humeral spot lacking but the intense narrow black lateral stripe widened somewhat in the humeral regions. Scales of the back and sides, above the lateral stripe, heavily outlined with dusky. All the fins somewhat dusky but without distinct black or white markings. Sides over the lateral stripe and below it with a steel-blue iridescence. Preopercle also with blue iridescence.

#### 17. *HYPHESSOBRYCON STIGMATIAS* Fowler.

*Hyphessobrycon stigmatias* FOWLER, Proc. acad. nat. sci. Phil., 1913, p. 547, fig. 14 (Tributary of the Madeira River near Porto Velho).

This species is known only from the type, 23 mm. long, No. 39231 A. N. S. P. Head 3.6; depth 3.6; D. 11; A. 19; scales 33, 9 scales between dorsal and ventral; snout 4; eye 2.5, interorbital 2.5 in the head.

Eleven predorsal scales. Maxillary with three cusps on its upper, anterior margin, suborbital nearly covering cheek.

Scales of back with dusky margins, fins all dusted; no defined humeral spot; a narrow dark lateral stripe widening above the middle of the anal, covering over half the caudal peduncle, contracted again on middle caudal rays.

#### 18. *HYPHESSOBRYCON ROBUSTULUS* (Cope).

*Hemigrammus robustulus* COPE, Proc. Amer. philos. Soc., 1870, **11**, p. 561 (Pebas); 1878, **17**, p. 690 (Peruvian Amazon); FOWLER, Proc. Acad. nat. sci. Phil., 1906, p. 335, fig. 24 (Pebas; Peruvian Amazon).

*Tetragonopterus robustulus* EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, **14**, p. 54; ULREY, Ann. N. Y. acad. sci., 1895, **8**, p. 286.

*Hyphessobrycon robustulus* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437.

HABITAT.—Upper Amazon.

One Cotype 8083 Acad. nat. sci. Phil.                      44 mm.                      Pebas

Head 3.4–3.5; depth 2–2.25; D. 11; A. 27; scales 7–35–6; eye 3 in the head; interorbital just equal to the eye.

Compressed; deepest at the vertical from the origin of the dorsal; depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rather narrow, without complete series of median scales.

Occipital process 4.25 in the distance from its base to the dorsal, bordered by 2 scales. Interorbital region very slightly convex. Frontal fontanel triangular, one half of the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind and below. Snout short, mouth large.

Maxillary equal to the eye. Mandible 2.5 in the head. Premaxillary with an inner row of five 5-pointed, and an outer row of four 3-pointed teeth. Maxillary with four or five rather small tricuspid teeth. Dentary with a graduated series of four large, 5-pointed, one small, 3-pointed and five or six minute conical teeth.

Gill-rakers 6 + 9.

Caudal seemingly naked. Lateral line with pores on 9 or 10 scales.

Origin of the dorsal equidistant from the caudal and snout. Origin of the anal on the vertical from the second dorsal ray. Anal emarginate. Ventrals on the vertical from about the fourth scale in front of the dorsal. Ventrals just reaching the anal or a little further. Pectorals reaching the ventrals.

Fins all dusky, the middle rays of the caudal black. Humeral spot indistinct, large, oval, and horizontally elongate. A broad leaden lateral stripe. Scales of the back outlined with pigment.

#### 19. *HYPHESSOBRYCON MELAZONATUS* Durbin.

Plate 26, fig. 4.

*HypheSSobrycon melazonatus* DURBIN, Bull. M. C. Z., 1908, **52**, p. 101 (Lago do Maximo; Silva, Lake Saraca); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 436.

HABITAT.—Amazon.

##### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20737 Type	1	about 38	Lago do Maximo	Agassiz
21069 Paratype	1	about 34	Silva, Lake Saraca	Thayer
20995	1	36	Serpa	Thayer Exped.

Head 3.5; depth 2.66–2.5; D. 11; A. 22; scales 5–34–3.5; eye 2.66 in head; interorbital equal to the eye.

Compressed, deepest at the origin of the dorsal; depth of head at the base of the occipital process 1.67 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of 9 scales.

Occipital process 5 in the distance from its base to the dorsal, bordered by 2 to 2.5 scales. Interorbital slightly convex. Frontal fontanel triangular, as wide as and nine tenths as long as, the parietal without the occipital



groove. Second suborbital leaving a very narrow naked margin behind and below. Maxillary equal to the eye; mandible a fifth longer than the maxillary. Snout short. Lower jaw heavy. Mouth large. Premaxillary with an inner series of five 4- or 5-pointed teeth and an outer series of three or four tricuspid teeth. Maxillary with one to three 3- to 5-pointed teeth. Dentary with a graduated series of four large 5-pointed teeth followed by six or more minute conical ones on the side.

Gill-rakers about  $9 + 7$ .

Anal sheath short, consisting of very small scales that do not reach the rays, about 9 in number, the first 6 together and the other 3 between the larger scales of the series just above the fin. Lateral line with pores on about 7 scales.

Origin of the dorsal equidistant from the snout and the caudal, penultimate ray one third of the longest which is 3.25 in the length. Caudal probably about equal to the head. Origin of the anal on the vertical from the last dorsal ray or a little behind it. Anal emarginate. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals just reaching the anal. Pectorals lapping half the length of the eye over the ventrals.

Webs of the dorsal and sometimes those of the anterior 7 or 8 anal rays dusky. A diffuse dark spot covering a little more than the lower half of caudal peduncle. Upper half of caudal peduncle silvery. A very faint humeral spot.

In the paratypes the second suborbital is not so wide as in the type and leaves a wider naked margin.

## 20. *HYPHESSOBRYCON EOS* Durbin.

Plate 23, fig. 4.

*Hyphessobrycon eos* DURBIN, Ann. Carnegie mus., 1909, **6**, p. 69 (Between Potaro Landing & Kangaruma); EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; Mem. Carnegie mus., 1912, **5**, 341, pl. 1, fig. 2.

HABITAT.—Guiana.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
1194 C. Type	1	36	Between Potaro Landing & Kangaruma	Shideler
1196 C., 11770 I. Paratypes	24	35-42	Between Potaro Landing & Kangaruma	Shideler
1195 C., 11771 I. Paratypes	43	19-34	Tukeit	Eigenmann

Head 3.25-3.33; depth 2.5-2.7; D. 11; A. 17-20; scales 6-33 or 34-4; eye 2.5 in the head, snout about 2 in the eye, interorbital almost equal the eye, 2.76 in head.

Compressed; depth of head at base of occipital process 1.5 in the greatest depth. Preventral region rounded, without complete, regular series of median scales. Predorsal region rounded, with complete series of 10 median scales.

Occipital process about 8 in the distance from its base to the dorsal, bordered by 2 or 3 scales. Interorbital slightly more convex than in any other species of the genus. Frontal fontanel small, triangular, narrower than the parietal and two thirds the parietal without the occipital groove. Second suborbital leaving a narrow naked margin behind but not below. Snout short, mouth large. Maxillary equal to the eye; mandible scarcely longer than the eye, about 2.3 in head. Premaxillary with three or four narrow tricuspid teeth in the outer row, and five or six tricuspid teeth in the inner row. Maxillary with five to seven conical or very narrow 3-pointed teeth. Dentary with a series of four or sometimes five tricuspid teeth followed by a graduated series of seven to ten minute conical and 3-pointed teeth on the sides.

Gill-rakers about 6 + 10.

Anal sheath of 4 to 7 scales covering the bases of the first 7 rays. Pores developed on 7 to 10 scales.

Origin of the dorsal equidistant from the caudal and snout, penultimate ray one third the longest which is 3-3.25 in the length. Origin of anal on the vertical from the last dorsal ray. Anal very slightly emarginate, third ray not reaching to the base of the last ray, the longest ray 1.33 in the length of the base, anal armature well developed. Caudal equal to the head. Ventrals weak, on the vertical from the first scale in front of the dorsal or from the first dorsal ray; ventrals barely reaching the anal. Pectorals just reaching the ventrals, distinctly longer than ventrals.

Humeral spot very faint, vertically elongate, very near the head. Lateral stripe narrow and very indistinct. Caudal spot intensely black, covering the ventral two thirds of the caudal peduncle, a little narrower in front than on the vertical from the origin of the lower caudal lobe, not extending onto the caudal rays. The black is on the skin without the scales and also in the scales. Top of head and dorsal scales very dark. Scales of upper half of the sides heavily outlined with dusky. All fin-webs dusky. Numerous chromatophores scattered over the rest of the body, especially large and prominent on

the cheeks.<sup>1</sup> In life, anterior half of anal, base of anal, sides just above the anal, and ventrals reddish; caudal red or orange to deep yellow, lower lobe often more colored than the upper one, base of dorsal, pectorals, cheeks, and under part of head yellow.

21. *HYPHESSOBRYCON INCONSTANS* (Eigenmann and Ogle).

Plate 27, fig. 1, 2; Plate 33, fig. 1, 2; Plate 78, fig. 5; Plate 79, fig. 2.

*Hemigrammus inconstans* EIGENMANN & OGLE, Proc. U. S. N. M., 1907, 33, p. 17, fig. 8 (Para).<sup>2</sup>

*Hyphessobrycon inconstans* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, 3, p. 437.

*Hyphessobrycon proteus* EIGENMANN, Indiana univ. studies, 1913, no. 18, p. 28.

HABITAT.—Colombia.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
5094 C. <sup>3</sup>	1	74	Quibdo	Eigenmann
5095 C., 12858 I.	100+		Quibdo	Eigenmann
5096 C., 12852 I.	68	23 <sup>4</sup>	Soplaviento	Eigenmann
5097 C., 12853 I.	54	45 <sup>4</sup>	Calamar	Eigenmann
5098 C., 12854 I.	47	47	Cienega at Calamar	Eigenmann
5099 C., 12855 I.	2		Puerta Wilches	Eigenmann
5100 C.	1		Below Buena Vista	Eigenmann
5101 C.	1	39	Honda	Eigenmann
5102 C., 12856 I.	7	50 <sup>4</sup>	Bernal Creek, near Honda	Eigenmann
12857 I.	1	30 <sup>5</sup>	Apulo	Gonzales

<sup>1</sup> All specimens at hand were preserved in formalin and have the black pigment emphasized.

<sup>2</sup> Type, 34591 U. S. N. M. Para ? Brazil, scales 6-32-4.5, A. 26, lateral line on left 13 + 4 + 2 + 3 + 1 + 7 + 2, on right 15 + 14 + 4; one maxillary tooth.

Paratypes, four 37-45 mm. to base of caudal (47-57 over all) A. 24-26, scales 6-32 to 33-5; lateral line complete in two, in another, on the left 10 + 1 + 2 + 16 + 3; on the right 17 + 2 + 1 + 9 + 3; in another it is complete to within two or three scales.

<sup>3</sup> Type of *H. proteus*. An examination of the specimens from Quibdo on which the description is based shows eighteen with a complete lateral line, eleven with the line complete on one side and not on the other and seventy-six with the line incomplete on both sides. In the following table showing the lateral line on the two sides of a number of Quibdo specimens the numbers in italics indicate scales with pores.

Length mm.	Left side	Totals	Right side
57	32	32	33 = 33
70	14 + 1 + 4 + 14	= 32,	32 = 12 + 1 + 1 + 10 + 1 + 3 + 3 + 1
70	22 + 4 + 2 + 2 + 1 + 2 + 1	= 34,	33 = 15 + 1 + 2 + 1 + 1 + 13
73	14 + 19	= 33,	33 = 16 + 9 + 2 + 6
72	18 + 15 + 2 + 3	= 33,	32 = 14 + 2 + 2 + 4 + 2 + 1 + 2 + 5
69	19 + 7 + 6 + 1 + 1	= 34,	33 = 24 + 1 + 2 + 6
68	32	= 32,	33 = 33
76	28 + 2 + 2	= 32,	33 = 19 + 2 + 12
65	35	= 35,	35 = 35
60	23 + 4 + 1 + 2 + 4	= 34,	34 = 18 + 1 + 2 + 2 + 11

Very similar to *Astyanax ruberrimus* from the San Juan and Dagua Rivers from which the specimens with a complete lateral line can only be distinguished with difficulty. Its formal distinguishing features are the smaller number of anal rays, and smaller number of scales, and the nature of the scales below the lateral line.

Head about 4; depth 2.6-2.75; D. 11; A. 24-26, scales 6-32 or 33-4.5 to 5.5; eye equal to interorbital, 2.75-3 in the head.

Compressed, depth of head at the base of the occipital process 1.5 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded, with complete median series of ten scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by about 2.5 to 3 scales. Interorbital convex. Second suborbital leaving a naked margin behind and below. Maxillary much shorter than the eye, about 3.5 in the head. Mandible a little longer than the maxillary, not longer than the eye. Premaxillary with five large 6- to 8-pointed teeth in the inner row, the last smaller than the rest and half hidden behind the one next to it, outer row with four 3- to 4-pointed teeth, set so as to coincide with the spaces between the first four of the inner series. Maxillary with one very broad, 7- to 8-pointed tooth. Dentary teeth large.

Anal sheath almost obsolete. Lateral line complete or irregularly incomplete, often interrupted.

Origin of the dorsal equidistant from the snout and caudal; penultimate ray 3 in the longest which is 3.5 in the length. Origin of anal on the vertical from the first scale behind the dorsal, anal emarginate. Ventrals on the vertical

<sup>3</sup> continued.

Length mm.	Left side	Totals	Right side
62	24 + 1 + 6 + 1 + 1	= 33,	33 = 22 + 1 + 8 + 1 + 1
51	22 + 12	= 34,	34 = 25 + 9
56	34	= 34,	34 = 34
62	32	= 32,	33 = 25 + 1 + 2 + 1 + 5
59	17 + 1 + 3 + 4 + 2 + 1 + 5	= 33,	33 = 20 + 5 + 2 + 1 + 5
65	33	= 33,	34 = 34
50	16 + 3 + 2 + 7 + 5	= 33,	33 = 33
64	33	= 33,	32 = 32
70	10 + 23	= 33,	33 = 10 + 23
56	10 + 22	= 32,	33 = 14 + 19
49	16 + 9 + 6 + 2	= 33,	33 = 16 + 8 + 2 + 3 + 2 + 2
65	23 + 1 + 5 + 4	= 33,	32 = 22 + 1 + 2 + 2 + 4 + 1
52	21 + 1 + 10	= 32,	32 = 27 + 1 + 4

Of the specimens from Calamar all but four have the lateral line incomplete. In the specimens from the Calamar Cienega the pores are between 7-22 in all but two. In one of the two it lacks but one or two scales of being complete, in the other it stutters as in most of the Quibdo specimens.

<sup>4</sup> Largest specimen.

<sup>5</sup> To base of caudal.

from the second scale in front of the dorsal. Ventrals reaching nearly or quite to the anal; pectorals reaching slightly beyond the base of the ventral.

Caudal spot conspicuous, not continued on the middle caudal rays. Humeral spot obscure and vertically elongated. Lateral band indistinct. Highly iridescent. Fins all dusky.

I hesitate to unite *H. proteus* from Colombia with *H. inconstans* from Para.

The following is the original description of *H. proteus*. The description above is drawn from two of the types of *H. inconstans*.

Head 4; depth 2.25–2.66; D. 11; A.  $\frac{22}{7}$ ,  $\frac{23}{4}$ ,  $\frac{24}{7}$ ,  $\frac{25}{11}$ ,  $\frac{26}{3}$ , the denominator indicating the number of individuals having the number of rays in the numerator. Scales 6 or 7 —  $\frac{32}{11}$ ,  $\frac{33}{26}$ ,  $\frac{34}{9}$ ,  $\frac{35}{2}$ , —  $4\frac{1}{2}$  to  $5\frac{1}{2}$ ; eye 2.6–2.75, equals interorbital; depth of caudal peduncle equal to its length.

Compressed, oval; dorsal and ventral profiles nearly equally curved, only a slight depression in the profile over the eyes; preventral area narrow, rounded, without a distinct median series of scales; or with a regular series of about eleven scales; postventral area rounded, with three or four scales; predorsal area keeled, with a distinct median series of nine or ten scales; occipital process about 5 in the length from its base to the dorsal, bordered by three or four pairs of scales; skull smooth, convex; parietal fontanel without the groove about one and a half times as long as the frontal fontanel. Second suborbital leaving a naked area one fifth to one half of its own width around its entire distal margin; maxillary-premaxillary border angulated, equal to a full diameter of the eye; the mouth terminal, the longitudinal extent of the premaxillary very short. Three or four teeth in the outer row of the premaxillary, five in the inner, the two rows parallel; a broad tipped, multipointed tooth on the maxillary; five rather small, 5-pointed graduate teeth in the mandible in front, none on the sides.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from snout and base of upper caudal lobe, its highest (second and third) rays about twice as high as the antepenultimate, the fin pointed, the highest ray a little longer than head; caudal lobes about 3 in the length; origin of anal behind the vertical from the last dorsal ray; anal emarginate, its base about 3.5 in the length; ventral usually not reaching anal, its origin equidistant from snout with the second or third scale in front of the dorsal, pectorals sometimes falling a little short of or extending a little beyond the origin of the ventrals.

Scales very regular, no interpolated rows of scales below the lateral line; the third row below the lateral line runs to the end of the anal, the fourth to the middle of the anal, the fifth to the sides over the first few anal rays; lateral line nearly straight; caudal lobes naked; anal with a sheath of a single row of scales; a large axillary scale; lateral line variable.

Silvery, a silvery lateral band; a faint humeral spot crosses the third scale of the lateral line; a large conspicuous triangular caudal spot extending on the bases of the middle caudal rays, not to their middle. Caudal lobes with cherry spots at the base becoming yellow toward the tip.

## 22. HYPHESSOBRYCON SANTAE (Eigenmann).

Plate 27, fig. 3; Plate 79, fig. 3, 3a.

*Hemigrammus santae* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 16 (Lagoa Santa).

*Tetragonopterus rivularis interrupta* Lütken, Vidensk. selsk., 1875, **12**, p. 215 (Lagoa Santa).

*Hyphessobrycon santae* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 158 (Sete Lagoas; Mogy das Cruzes).

HABITAT.—Paraguay; Southeastern Brazil.

### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
55652 <sup>1</sup> Cotypes	2		Lagoa Santa	Reinhardt
10182 I.	4		Villa Rica, Colonia Gonzales	Anisits
3033 C.	6	33-42	Sete Lagoas	Haseman
3034 C.	1	58	Mogy das Cruzes	Haseman

Head 3.5; depth 2.6-3; D. 11; A. 20-22; scales 5-32-4, to 6-30-3.5, and 5-33-3.5; eye 2.25 in the head, equals the interorbital.

Compressed, deepest on the vertical from the fourth scale in front of the dorsal; depth of head at the base of the occipital process 1.33 in the greatest depth. Preventral region rounded, without a complete series of median scales. Predorsal region rounded, with regular median series of 11 scales.

Occipital process 6 in the distance from its base to the dorsal, bordered by 3.25 to 3.5 scales. Interorbital convex. Maxillary 3 in the head, mandible 2.5. Second suborbital leaving a naked margin behind and below. Premaxillary with four large 4- to 7-pointed teeth in the inner and three 3- to 5-pointed

<sup>1</sup> U. S. National Museum. Cotypes of *H. interrupta* and of *santae*.

ones in the outer row. Maxillary with two 3- to 5-pointed teeth. Dentary with a graduated series of five 5- to 7-pointed teeth.

Caudal naked, but with a sheath two scales deep. Anal sheath short. Lateral line with about 17 scales with pores.

Origin of the dorsal half the length of the eye nearer the caudal than the snout, the penultimate ray 2.5 in the longest which is 3.75 in the length. Origin of the anal on the vertical from the second scale behind the dorsal. Longest anal ray is 1.5 in the anal base. Ventrals on the vertical from the second scale in front of the dorsal. Ventrals reaching or not reaching the anal, pectorals reaching or not reaching the ventrals.

Humeral spot usually obscure; caudal spot usually faint, extending to the end of the middle caudal rays; lateral band very faint, overlaid with silvery, distinct stripes following the scales above the lateral line; dorsal and anal dusky.

### 23. *HYPHESSOBRYCON META*E Eigenmann and Henn.

Plate 93, fig. 3.

*Hyphessobrycon metae* EIGENMANN & HENN, Indiana univ. studies, 1914, no. 24, p. 233.

HABITAT.—Rio Meta.

#### *Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
13421 I. Type	1	34	Barrigona, Rio Meta	Gonzales
13422 I. Paratypes	66	16-35	Barrigona, Rio Meta	Gonzales

Head 3.5-4, equal to depth at origin of dorsal; D. 11; A. 19-23,  $\frac{19}{2}$ ,  $\frac{20}{1}$ ,  $\frac{21}{4}$ ,  $\frac{22}{4}$ ,  $\frac{23}{1}$ , (the denominator represents the number of individuals); scales about 30 in a longitudinal series, 10 in transverse series; pores developed on 6 (rarely 7) scales; 9 or 10 scales between occipital and dorsal origin; scales 5-6 + 24-4; eye 2.3-2.6 in head, about equal to interorbital; caudal peduncle about equal to eye and 1.2 in its own depth.

Slender, compressed; predorsal area rounded, with a median series of 9 or 10 scales, preventral area rounded, with a median interpolated series of small (6) scales. Occipital process 6 in the distance from its base to the dorsal, bordered by 2 or 3 scales, interorbital slightly convex; fontanel very large. First and second suborbitals leaving a high naked margin behind and below. Mouth blunt, terminal; maxillary five sixths the length of the eye. Pre-

maxillary with three or four narrow tricuspid or broadly conical teeth in the outer row, five 2- to 4-pointed teeth in a second series, an inner series of very small tricuspid or broadly conical teeth immediately behind them. Maxillary with two small tricuspid and one conical tooth, mandible with four strong 3- to 5-pointed incisors in each ramus followed by about seven minute conical or recurved teeth on the sides. Gill rakers 6 + 5, short and strong.

Origin of dorsal about equidistant from snout and base of middle caudal rays, its height 3.2 to 3.5 in the length; adipose well developed; height of anal lobe 4 to 5 in length of fish. Caudal deeply forked, its lobes equal, about 4.5 in entire length. Anal origin slightly behind vertical from last dorsal ray; pectorals reach beyond ventrals; ventrals to beyond anal origin.

An obscure dusky, humeral spot, operculum underlaid with a dusky vertical semilunar area; top of head deep black produced into a line from occiput to dorsal. A narrow intense lateral stripe from upper margin of operculum to below last dorsal rays, broadening to a heavy broad black band on the caudal peduncle and an oblong caudal spot, the latter produced as a triangle to the tips of the middle caudal rays. Margins of scales above lateral stripe outlined with dusky, below heavily sprinkled with chromatophores. Bases of caudal lobes in life evidently tinged with deep red.

#### 24. *HYPHESSOBRYCON AGULHA* Fowler.

*Hyphessobrycon agulha* FOWLER, Proc. Acad. nat. sci. Phil., 1913, p. 549, fig. 15 (Madeira River, 200 miles of W. Long. 62° 20'; above Falls of Guajaramirim; Igarapé de Candalaria, tributary of the Madeira River, about S. Lat. 8° 45', W. Long. 63° 54'; tributaries of the Madeira River near Porto Velho).

Known from the specimens in the collection of the Academy of Natural Sciences of Philadelphia; the largest 42 mm. in length.

Head 3.75; depth 3.125; D. 12; A. 23; scales 6-12 + 22-3; snout 3.75, eye 2.4, interorbital 2.8 in the head.

Nine predorsal scales, maxillary reaching to the vertical from the anterior margin of the pupil; premaxillary with 8 teeth in each series. No maxillary teeth; mandible with four large quinquidentate teeth in front and small conic teeth on the side; suborbital leaving a very narrow naked strip in lower angle. Origin of dorsal equidistant from tip of snout and tip of adipose. No distinct caudal spot, humeral region with an elliptical, horizontal blotch continued downward. Fins pale, middle caudal rays dusky.



25. *HYPHESSOBRYCON ANISITSI* (Eigenmann).

Plate 28, fig. 1; Plate 79, fig. 4.

*Hemigrammus anisitsi* EIGENMANN, Proc. U. S. N. M., 1907, **33**, p. 16 (Villa Rica).*Hemigrammus lütkeni* EIGENMANN & KENNEDY, (in part, *non* Boulenger) Proc. Acad. nat. sci. Phil., 1903, p. 519 (Estancia la Armonia).*Hyphessobrycon anisitsi* EIGENMANN, Rept. Princeton univ. exped. Patagonia, 1910, **3**, p. 437; ELLIS, Ann. Carnegie mus., 1911, **8**, p. 158.

HABITAT.—Paraguay; Upper Parana Basin; Uruguay Basin.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
10182a I. Type	1	37	Villa Rica, Paraguay	Anisits
10182a I. Paratypes	3		Villa Rica	Anisits
9995 I. Paratypes	8	10-25 <sup>1</sup>	Estancia la Armonia, Paraguay	Anisits
3016 C.	36	30-45	Miguel Calmon, Tieté Basin	Haseman
3017 C.	21	21-44	Jundaihy, São Paulo	Haseman
3072 C.	2	53-55	Arequa, Paraguay	Haseman
2947 C.	3	26-35	Cacequy, Uruguay Basin	Haseman
3015 C.	7	41-57	Sapucay, Paraguay	Haseman

Head 3.5; depth 2.75-3; D. 11; A. 22 to 26; scales 6-33 to 36-5 or 6; lateral line with pores on 8 to 25 scales; eye about 2.75 in the head, interorbital about 3.

Compressed; depth of head at the base of the occipital process 1.25 in the greatest depth. Preventral region rounded, without complete series of median scales. Predorsal region rounded with complete median series of 11 to 13 scales.

Occipital process 4 in the distance from its base to the dorsal, bordered by 3.5 to 4 scales. Interorbital slightly convex. Frontal fontanel triangularly oval, three fourths the length of the parietal without the occipital groove. Second suborbital small, its free margin surrounded with a naked margin of half its width or less. Mouth moderately large. Maxillary not as long as the eye, 3 in the head. Mandible a little longer than the eye. Premaxillary with an inner row of five teeth graduated from the second of the series which is 5- or 6-pointed, the fifth is 3-pointed and much smaller than the fourth; the outer row containing 2- to 4-pointed teeth. Maxillary with one 3-, rarely 5-pointed, tooth. Dentary with a graduated series of four 4- to 6-pointed teeth, and five or six minute conical or narrowly tricuspid ones on the side.

Gill-rakers 8 or 9 + 7.

Anal sheath consisting of 11 or 12 scales graduated in size from the first and covering the bases of 11 to 13 anal rays. Lateral line with pores on 8 to 25 scales, the average being about 16 or less. Sometimes many of the scales immediately following those with the pores have a notch on the margin.

Origin of dorsal equidistant from the snout and the base of the caudal or a little farther back, longest ray about 4 in the length. Caudal a little longer than the head. Origin of anal on the vertical from the fourth to ninth dorsal rays. Anal deeply emarginate, its longest ray 1.5 in the anal base. An anal armature developed on the first five rays of males 38–45 mm. long. Ventrals on the vertical from the third to fifth scales in front of the dorsal. Ventrals just reaching the anal. Pectorals a little more than reaching the ventrals.

Dorsal hyaline, caudal spot forming a band on the end of the caudal peduncle, fainter above and below, rather abruptly continued posteriorly to the end of the middle caudal rays, gradually narrowed in front and continued forward in a dark lateral stripe; caudal lobes hyaline; humeral spot vertically elongate. Distal third of the anal dusky, basal two thirds of anterior rays free from pigment. Scales along the dorsal margined with dusky. A silvery iridescence on the sides except the upper two rows of scales. In life the caudal lobes, the anal and region just above the anal, and the dorsal probably are a shade of red or yellow.

The five specimens from Sapucay (3015 cm.) vary from typical specimens in having 25 to 29 anal rays. One of these specimens has also a 5-pointed tooth in the maxillary.

## 26. *HYPHESSOBRYCON LÜTKENI* (Boulenger).

Plate 28, fig. 2; Plate 79, fig. 1, 5.

*Tetragonopterus fasciatus interruptus* EIGENMANN (in part, *non* Lütken), Ann. N. Y. acad. sci., 1894, 7, p. 634 (Rio Grande do Sul).

*Hemigrammus interruptus* FOWLER (*non* Lütken), Proc. Acad. nat. sci. Phil., 1906, p. 335 (Jacuhy).

*Tetragonopterus lütkeni* BOULENGER, Ann. mag. nat. hist., 1887, ser. 5, 19, p. 173 (Rio Grande do Sul); EIGENMANN & EIGENMANN, Proc. U. S. N. M., 1891, 14, p. 53; ULREY, Ann. N. Y. acad. sci., 1895, 8, p. 287.

*Hemigrammus lütkeni* COPE, Proc. Amer. philos. soc., 1894, 33, p. 91 (Rio Grande do Sul); EIGENMANN & KENNEDY (in part), Proc. Acad. nat. sci. Phil., 1903, p. 519 (Arroyo Pypucu; Arroyo Trementina); EIGENMANN, Ann. Carnegie mus., 1907, 4, p. 126, (Puerto Max, Colonia Gonzales).

*Hyphessobrycon lütkeni* EIGENMANN, Rept. Princeton univ. exped. Patagonia 1910, 3, p. 437; ELLIS, Ann. Carnegie mus., 1911, 8, p. 159.

HABITAT.—Rio Grande do Sul and Paraguay Basins.

*Specimens examined.*

Catalogue number	Number of specimens	Size in mm.	Locality	Collector
20699	7	43-61	Maldonado	T. G. Cary
9996 I.	5	15-31	Arroyo Trementina	Anisits
11260 I.	6	23-29	Colonia Gonzales	Anisits
10294 I.	9	31-44	Puerto Max?	Anisits
9994 I.	41	25-40	Arroyo Pypucu	Anisits
4890 I.	3	53-65	Rio Grande do Sul	Von Ihering
3047 C.	58	25-69	Campos	Haseman
3041 C.	66	31-69	Porto Alegre	Haseman
3042 C.	11	40-54	Lagoa Feia	Haseman
3006 C.	9	26-48	Cacequy	Haseman
3005 C.	13	38-49	Muniz Freire	Haseman
2934 C.	1251	19-60	Jacarehy	Haseman
2933 C.	4	12-19	Jacarehy	Haseman
3073 C.	1	45	Arequa, Paraguay	Haseman
3074 C.	2	41-51	Sapucay, Paraguay	Haseman
2950 C.	6	40-48	Sao Joao da Barra	Haseman

Head 3.8-4.4; depth 2.35-2.6; D. 11; A. 20-26; scales 5 or 6-30 to 35-4 or 5; eye 2.75 in the head, equals the interorbital.

Compressed, deepest at the vertical from the origin of the dorsal. Depth of head at the base of the occipital processes 1.87 in the greatest depth. Preventral region rounded, without complete median series of scales. Predorsal region rounded, with complete median series of 9 or 10 scales.

Occipital process about 6 in the distance from its base to the dorsal, bordered by 3 scales. Interorbital convex. Frontal fontanel triangular, two thirds of the parietal without the occipital groove. Second suborbital leaving a naked margin sometimes equal to one third of its width, behind and below. Maxillary three in the head. Mandible equal to the eye. Premaxillary with five 5- to 8-pointed teeth in the inner row and two to four, usually three, 5- to 7-pointed teeth in the outer row. Maxillary with two, rarely three, large, 6- to 9-pointed teeth. Dentary with a graduated series of six or seven large, 6- to 8-pointed teeth or the last one only 5-pointed and about half the height of its immediate predecessor. Beyond these is one small 4-pointed tooth which is about one fourth of the smallest of the continuous series.

Gill-rakers 13 + 7.

Anal sheath short, consisting of 7 scales and covering the bases of the first 8 rays. Lateral line having pores on 5 to 20 scales.<sup>1</sup>

<sup>1</sup> In three specimens of 2934 C M. the lateral line is complete; out of nine specimens of 3006 C. M. one 32 mm. long the line is complete; of 3042 two specimens the lateral line is nearly complete and one has it interrupted 25 + 1 + 7 on one side and 17 + 2 + 2 + 5 + 3 + 5 on the other.

Origin of dorsal equidistant from snout and base of the caudal, penultimate ray 2.5 in the longest which is 4 in the length. Origin of anal on the vertical from the last dorsal ray; anal emarginate, its longest ray 2 in the length of the base. Ventrals on the vertical from between the first and second scales in front of the dorsal. Ventrals barely or not quite reaching the anal; pectorals almost reaching ventrals.

Caudal spot dark, sometimes reaching the tips of the middle caudal rays, continued forward as a black stripe which is (except in formalin specimens) overlaid with the broad silvery lateral band. Humeral spot large, very distinct, usually elongate vertically, the larger upper part surrounded by light in front and behind. All scales below the second series above the lateral line iridescent. The four scales between the upper end of the humeral spot and the head are bluish iridescent. Anal and dorsal a little dusky.

Five specimens 20895 and 20893 in part, 33–39 mm. (Muriáhe, Hartt, and Copeland), are probably a variety of *H. lütkeni*. They differ from the type as follows:—

Head 3–3.33, anal 22–26, scales 6–31 to 33–5.5, eye 2.5 in the head, inter-orbital 3.

Predorsal region with 11 scales in the complete median series.

Occipital process 5 in the distance from its base to the dorsal. Maxillary widest near its tip, instead of in its middle portion, as in typical specimens. Pre-maxillary with five 5- to 7-pointed teeth in the inner and two or three tricuspid ones in the outer row. Maxillary with two 6- to 7-pointed teeth which are somewhat chisel-shaped.

Ventral just reaching the anal, pectorals reaching half the length of the eye beyond the base of the ventrals.

Caudal spot continued to the end of the middle caudal rays. Humeral spot very faint.

The specimens from the Paraguay Basin have the caudal spot very heavy and extending band-like over the full width of the peduncle.

## 27. *HYPHESSOBRYCON RETICULATUS* Ellis.

Plate 29, fig. 2.

*Hyphessobrycon reticulatus* ELLIS, Ann. Carnegie mus., 1911, 8, p. 153, pl. 2, fig. 2 (Campos).

HABITAT.—Southeastern Brazil.

PLATE 9.

**PLATE 9.**

- Fig. 1. *Moenkhausia cotinho* Eigenmann.  
11819 I. U. M. 55.5. Crab Falls, British Guiana.
- Fig. 2. *Moenkhausia ceros* Eigenmann.  
20955 M. C. Z. 50 mm. (caudal broken). *Type.* Lake Hyanyary, Brazil.
- Fig. 3. *Moenkhausia copei* (Steindachner).  
11820 I. U. M. 55 mm. Rockstone, British Guiana.







PLATE 10.

**PLATE 10.**

- Fig. 1. *Knodus chapadae* (Fowler).  
21829 A. N. S. P. *Paratype* 44 mm. Chapada, Brazil.
- Fig. 2. *Knodus breviceps* (Eigenmann).  
20692 M. C. Z. 84 mm. *Cotype*. Goyaz, Brazil.
- Fig. 3. *Knodus moenkhausii* (Eigenmann & Kennedy).  
20760 M. C. Z. 41 mm. Tabatinga, Brazil.
- Fig. 4. *Knodus heteresthes* (Eigenmann).  
20862 M. C. Z. 51 mm. *Cotype*. Tapajos, Brazil.



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PLATE 11.

PLATE 11.

- Fig. 1. *Gymnocorymbus ternetzi* (Boulenger).  
11435 I. U. M. 39 mm. to base of caudal. *Cotype.* Descalvados, Paraguay.
- Fig. 2. *Gymnocorymbus thayeri* Eigenmann.  
19242 M. C. Z. 40 mm. *Type.* Amazon.

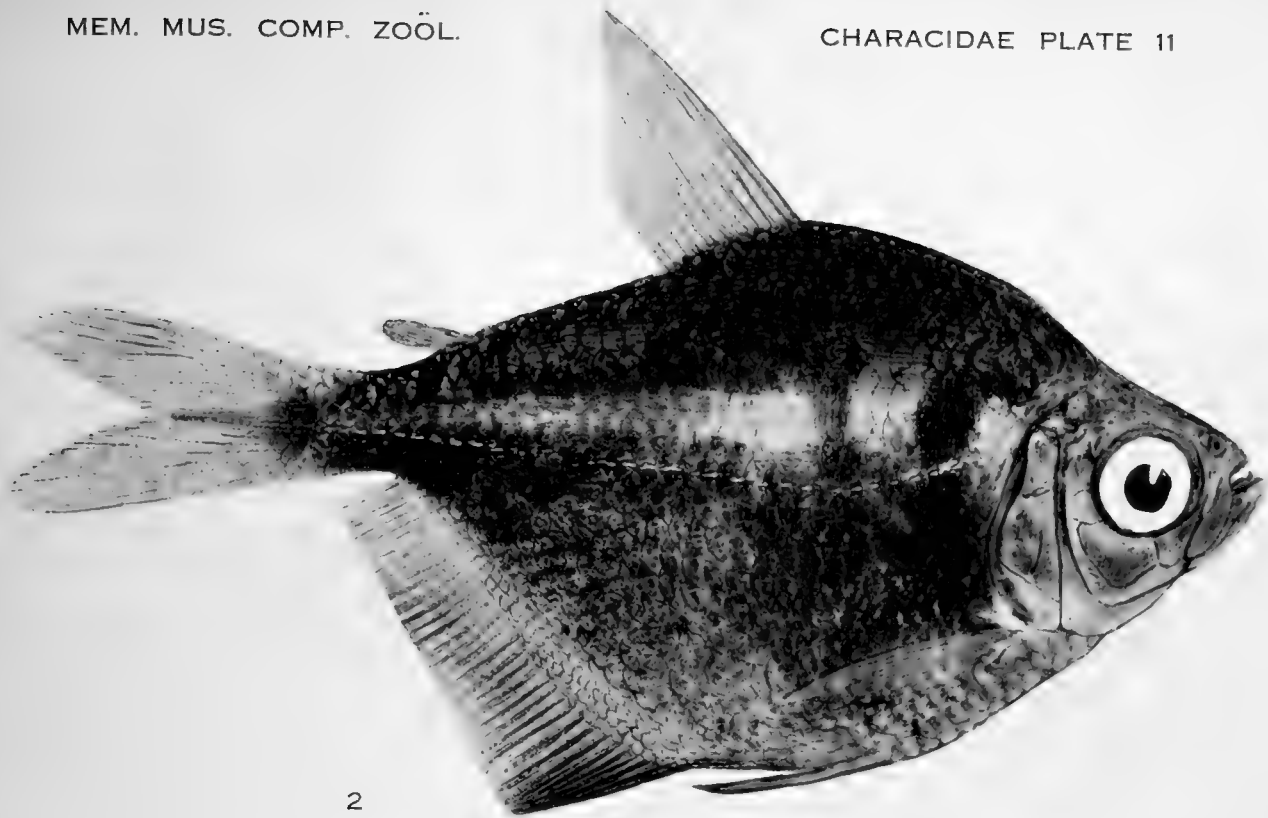






PLATE 13.

PLATE 13.

- Fig. 1. *Pristella aubynei* Eigenmann. (Mem. Carnegie mus., **5**, Plate 45, fig. 4).  
1042 C. M. 50 mm. *Type*. Lama Stop-Off, British Guiana.
- Fig. 2. *Pristella riddlei* (Meek). (Mem. Carnegie mus., **5**, Plate 45, fig. 3).  
1309 C. M. 44.5 mm. Botanic Garden, Georgetown, British Guiana.
- Fig. 3-5. *Markiana nigripinnis* (Perugia). (Steindachner, Sitzungsab. K. akad. wiss., **100**, Plate 3).  
La Plata Basin.

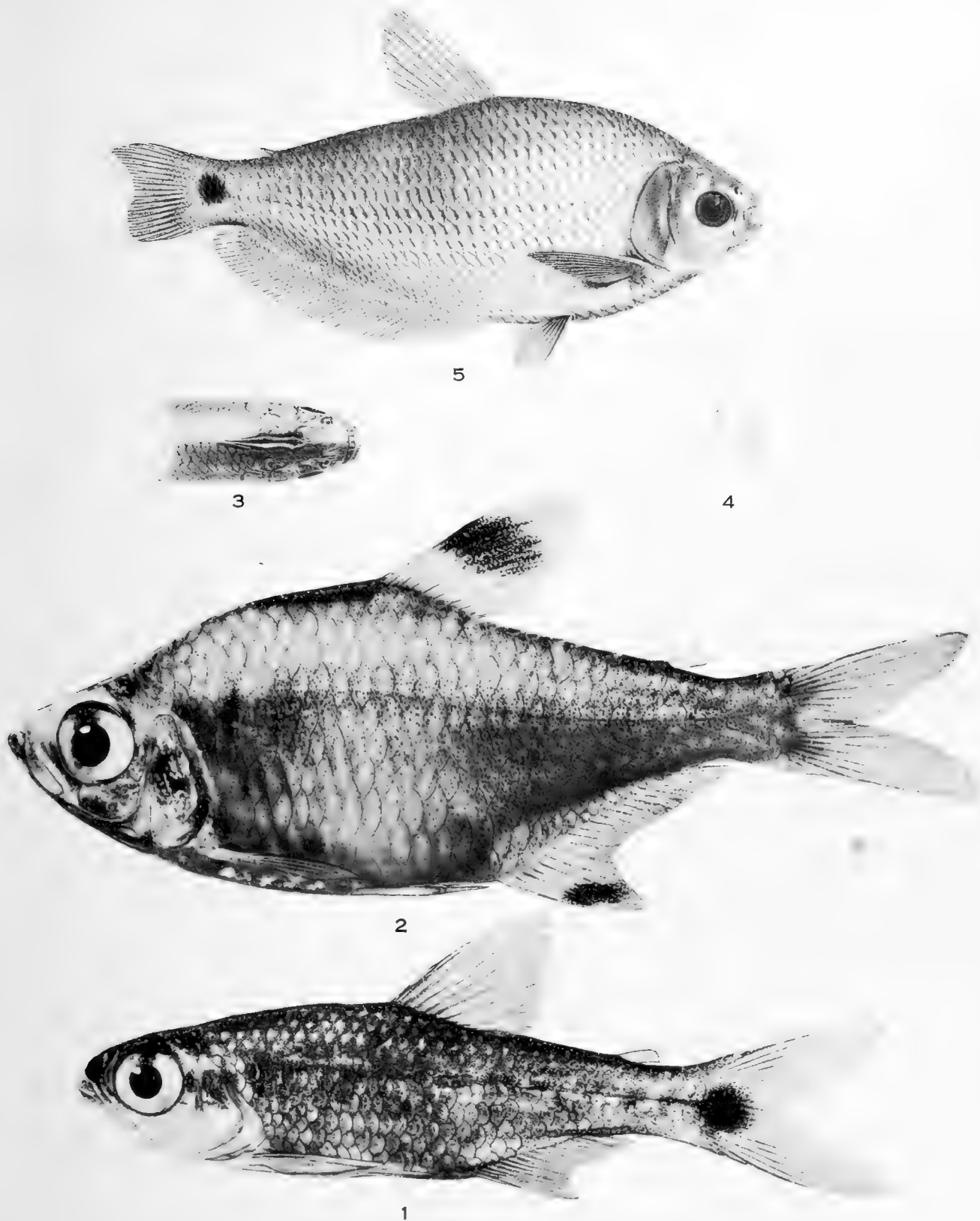




PLATE 17.

**PLATE 17.**

- Fig. 1. *Hemigrammus ulreyi* (Boulenger).  
3050 C. M. 44 mm. Jauru, Brazil.
- Fig. 2. *Hemigrammus coeruleus* Durbin.  
20801 M. C. Z. 40 mm. *Type*. Manacapura, Brazil.
- Fig. 3. *Hemigrammus elegans* (Steindachner).  
20869 M. C. Z. 35 mm. Tapajos, Brazil.



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PLATE 18

PLATE 18.

- Fig. 1. *Hemigrammus nanus* (Lütken).  
44958 U. S. N. M. *Cotype*. 47 mm. Lagoa Santa, Brazil.
- Fig. 2. *Hemigrammus levis* Durbin.  
20738 M. C. Z. 47 mm. *Type*. Amazon.
- Fig. 3. *Hemigrammus micropterus* Meek.  
10802 I. U. M. 36 mm. *Cotype*. Los Castillas, Venezuela.
- Fig. 4. *Hemigrammus hyanuary* Durbin.  
20955 M. C. Z. 37.5 mm. (To middle caudal rays). *Cotype*. Hyanuary, Brazil.

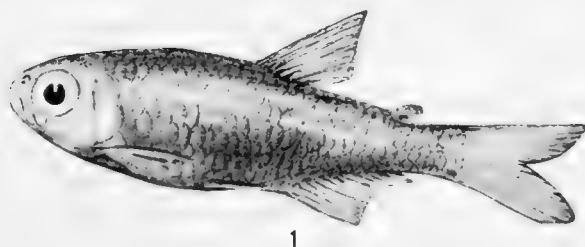
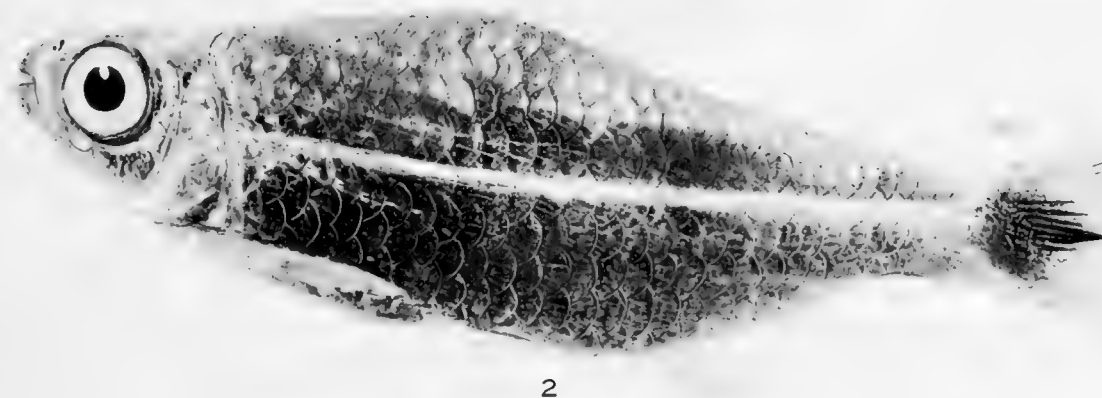
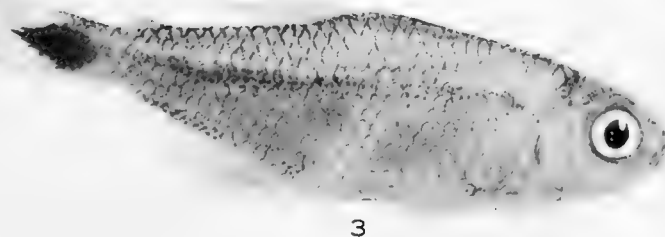




PLATE 19.

PLATE 19.

- Fig. 1. *Hemigrammus matei* Eigenmann.  
11438 I. U. M. 43 mm. *Type.* Argentina.
- Fig. 2. *Hemigrammus tridens* Eigenmann.  
11262 I. U. M. 20 mm. (exclusive of caudal). *Type.* Arroyo Pypucu, Paraguay.
- Fig. 3. *Hemigrammus ocellifer* (Steindachner).  
20774 M. C. Z. 33 mm. Tabatinga, Brazil.

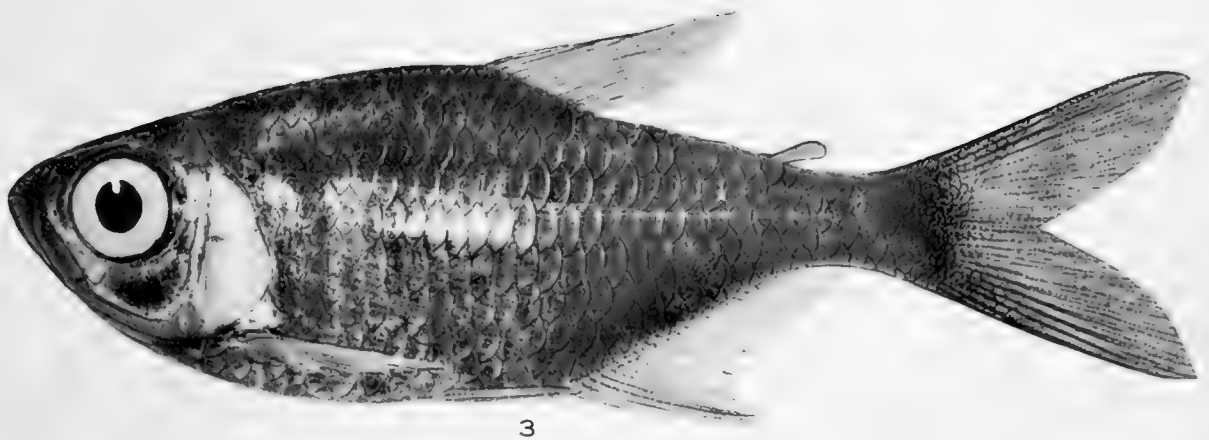






PLATE 20.

PLATE 20.

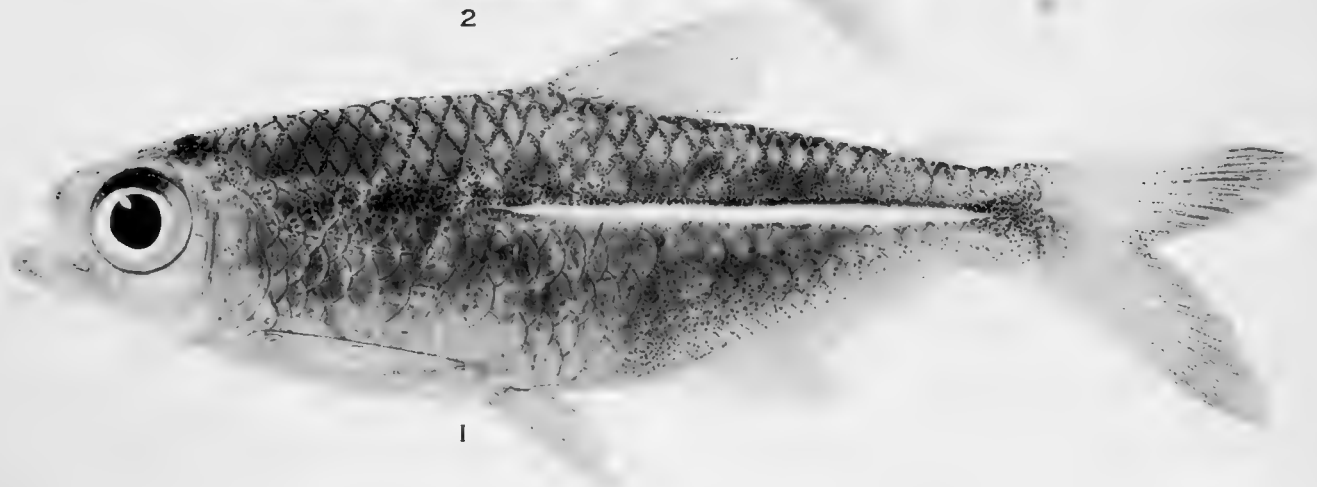
- Fig. 1. *Hemigrammus marginatus* Ellis. (Ann. Carnegie mus., 8, Plate 3).  
3053 C. M. 38 mm. *Type*. Queimadas, Brazil.
- Fig. 2. *Hemigrammus schmardae* (Steindachner).  
— M. C. Z. 22 mm. to end of middle caudal rays. Manaos, Brazil.
- Fig. 3. *Hemigrammus cupreus* Durbin.  
20952 M. C. Z. 48 mm. *Cotype*. Jatuarana, Brazil.



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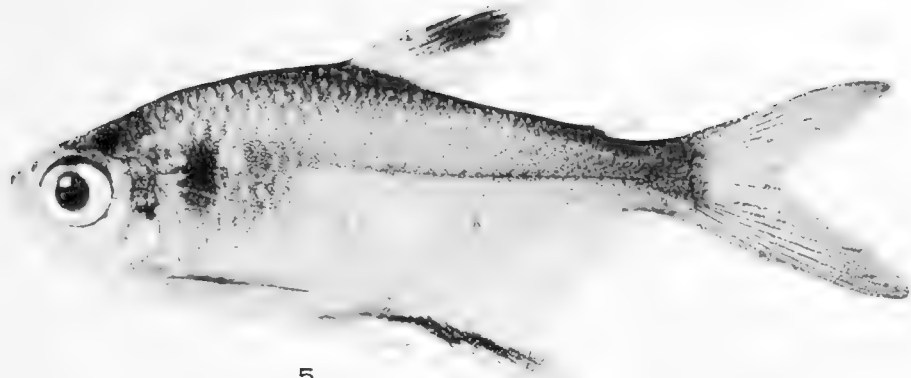


PLATE 21.

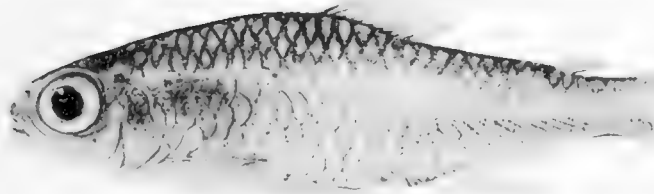
PLATE 21.

(Mem. Carnegie mus., 5, Plate 48).

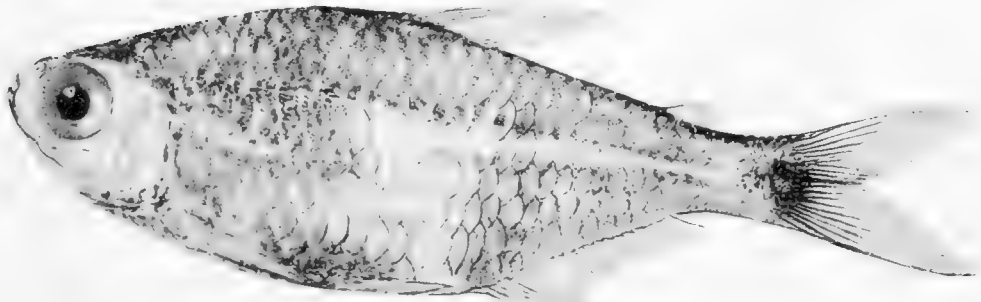
- Fig. 1. *Hemigrammus orthus* Durbin.  
1477 C. M. 28 mm. *Type*. Tukeit, British Guiana.
- Fig. 2. *Hemigrammus ocellifer* (Steindachner).  
1455 C. M. 40 mm. Gluck Island, British Guiana.
- Fig. 3. *Hemigrammus rodwayi* Durbin.  
1450 C. M. 46 mm. *Type*. Georgetown, British Guiana.
- Fig. 4. *Hemigrammus erythrozonus* Durbin.  
1448 C. M. 32 mm. *Type*. Erukin, British Guiana.
- Fig. 5. *Hemigrammus unilineatus* (Gill).  
1446 C. M. 41 mm. Wismar, British Guiana.



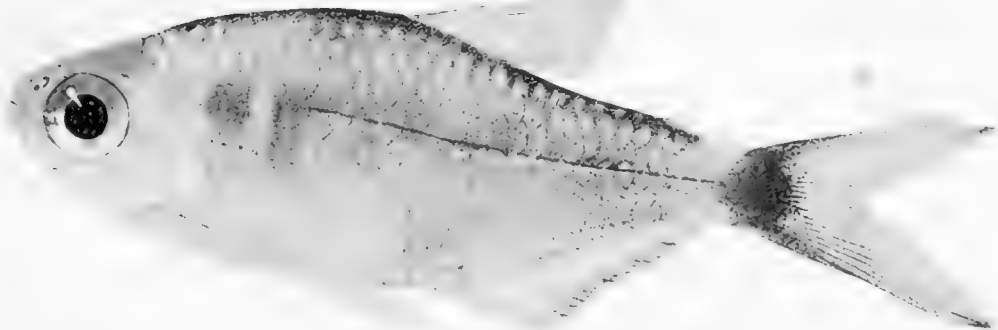
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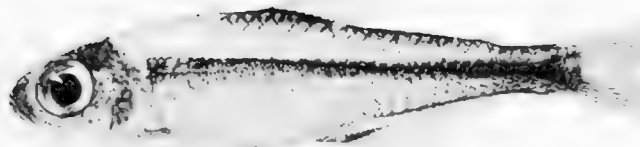
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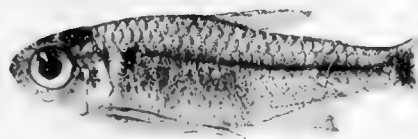


PLATE 22.

PLATE 22.

(Mem. Carnegie mus., 5, Plate 49).

- Fig. 1. *Hyphessobrycon stictus* Durbin.  
1197 C. M. 38 mm. *Type.* Lama Stop-Off, British Guiana.
- Fig. 2. *Hemigrammus analis* Durbin.  
1466 C. M. 35 mm. *Type.* Rockstone, British Guiana.
- Fig. 3. *Hyphessobrycon minor* Durbin.  
1189 C. M. 19 mm. *Type.* Konawaruk, British Guiana.
- Fig. 4. *Hyphessobrycon gracilis* (Reinhardt).  
1247 C. M. 24 mm. Gluck Island, British Guiana.
- Fig. 5. *Hemigrammus cylindricus* Durbin.  
1461 C. M. 57 mm. *Type.* Tumatumari, British Guiana.
- Fig. 6. *Hyphessobrycon minimus* Durbin.  
1193 C. M. 18 mm. *Type.* Cane Grove Corner, British Guiana.
- Fig. 7. *Hemigrammus iota* Durbin.  
1458 C. M. 18 mm. *Type.* Gluck Island, British Guiana.



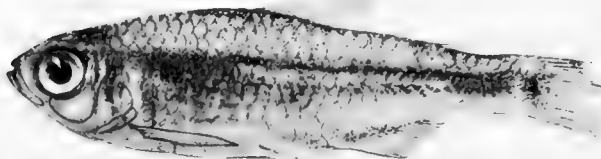
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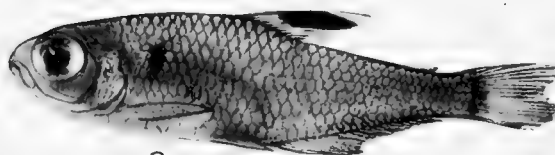
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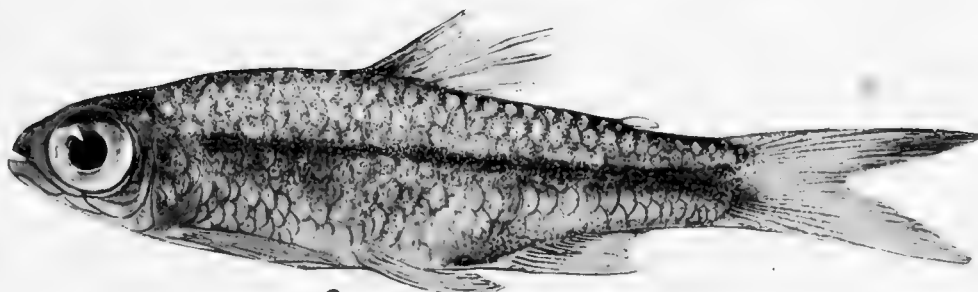
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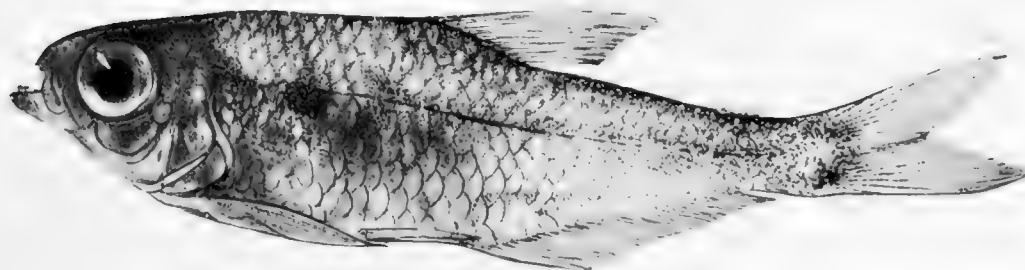
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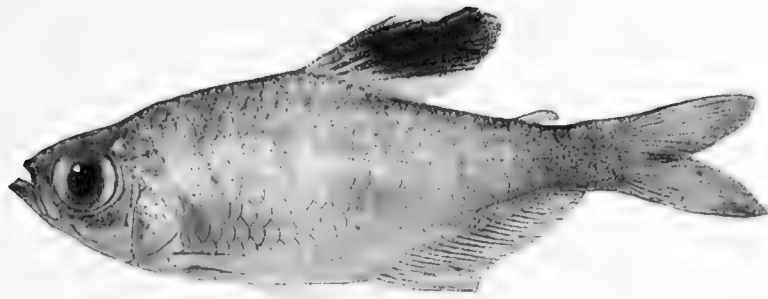


PLATE 23.

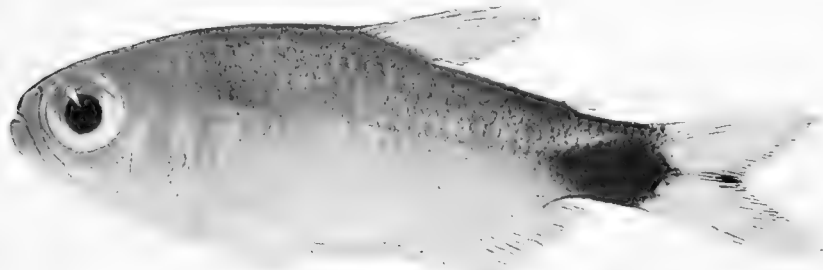
PLATE 23.

(Mem. Carnegie mus., 5, Plate 50).

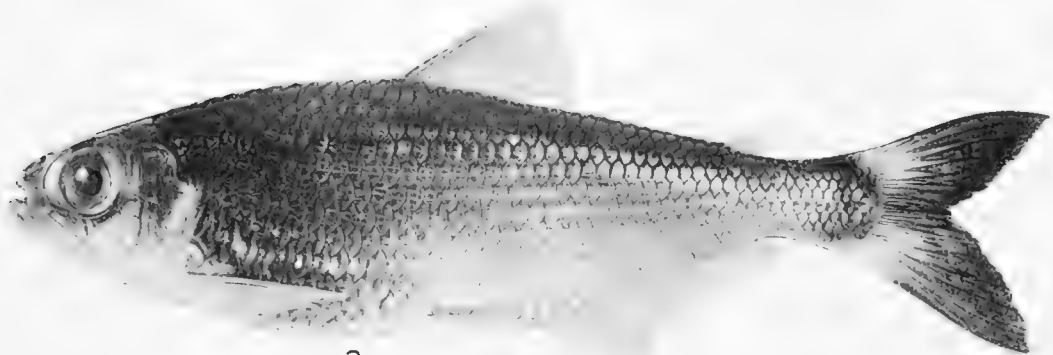
- Fig. 1. *Creotochanes caudomaculatus* (Günther).  
1385 C. M. 100 mm. Tumatumari, British Guiana.
- Fig. 2. *Creotochanes melanurus* (Bloch).  
1393 C. M. 96 mm. Malali, British Guiana.
- Fig. 3. *Creotochanes affinis* (Günther).  
1407 C. M. 96 mm. Tumatumari, British Guiana.
- Fig. 4. *Hyphessobrycon eos* Durbin.  
1194 C. M. 36 mm. *Type*. Creek near Potaro Landing, British Guiana.
- Fig. 5. *Hyphessobrycon rosaceus* Durbin.  
1190 C. M. 35 mm. *Type*. Gluck Island, British Guiana.



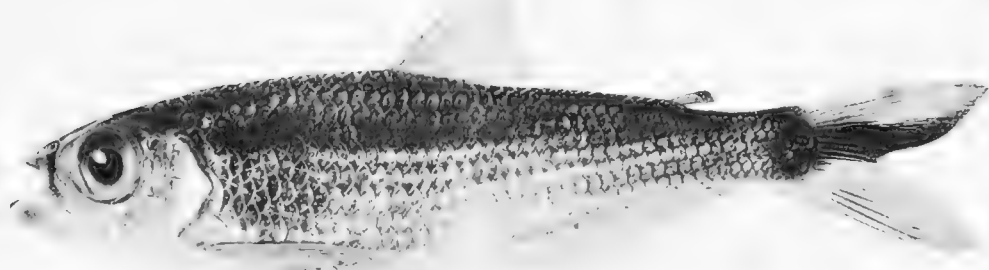
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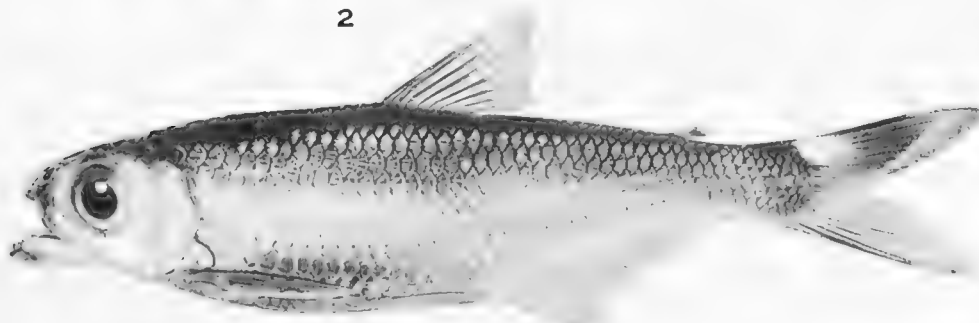
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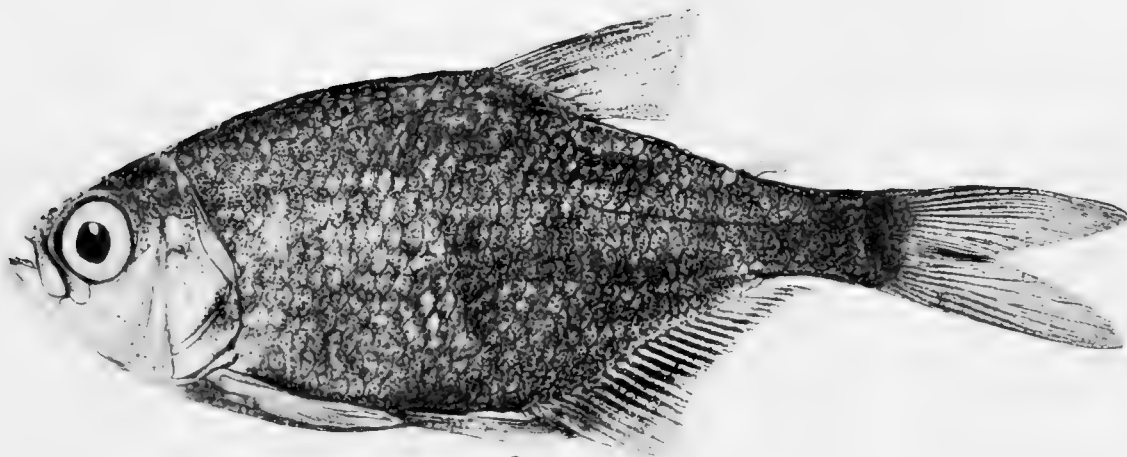
PLATE 24.

PLATE 24.

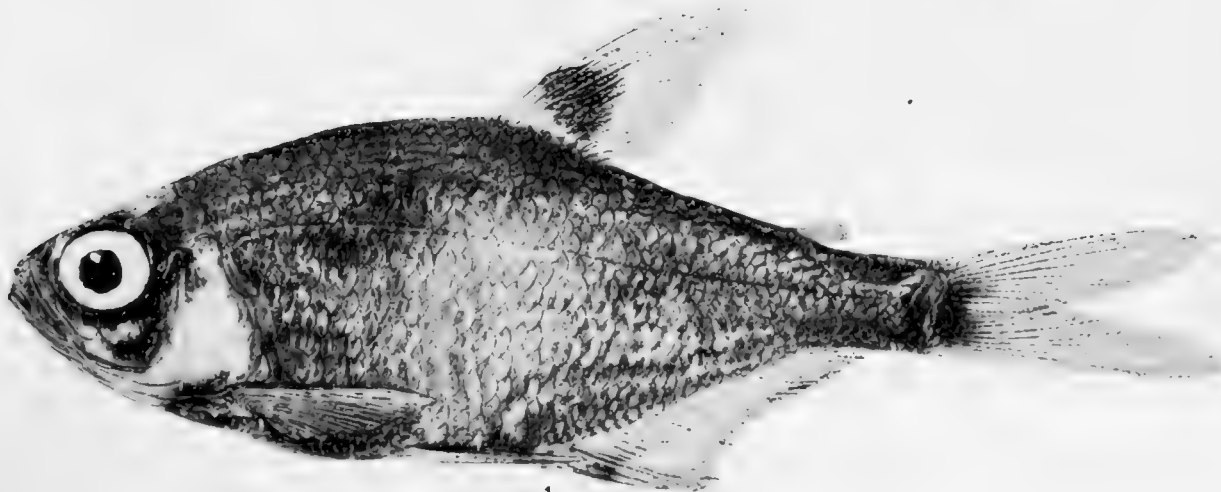
- Fig. 1. *Hyphessobrycon compressus* (Meek).  
10929 I. U. M. 44 mm. Perez, Mexico.
- Fig. 2. *Hyphessobrycon milleri* Durbin.  
11255 I. U. M. 40 mm. *Type*. Los Amates, Guatemala.
- Fig. 3. *Hyphessobrycon callistus* (Boulenger).  
10039 I. U. M. 33 mm. Arroyo Trementina, Paraguay.



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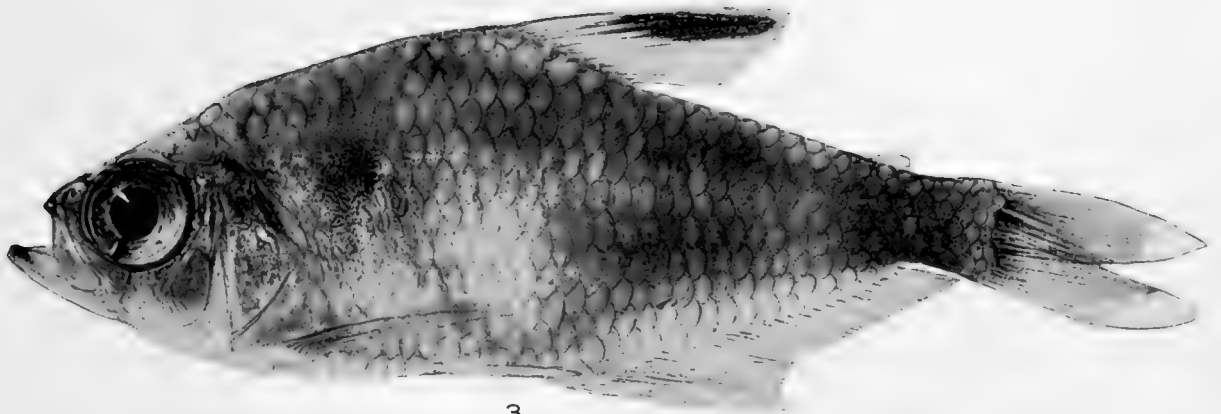
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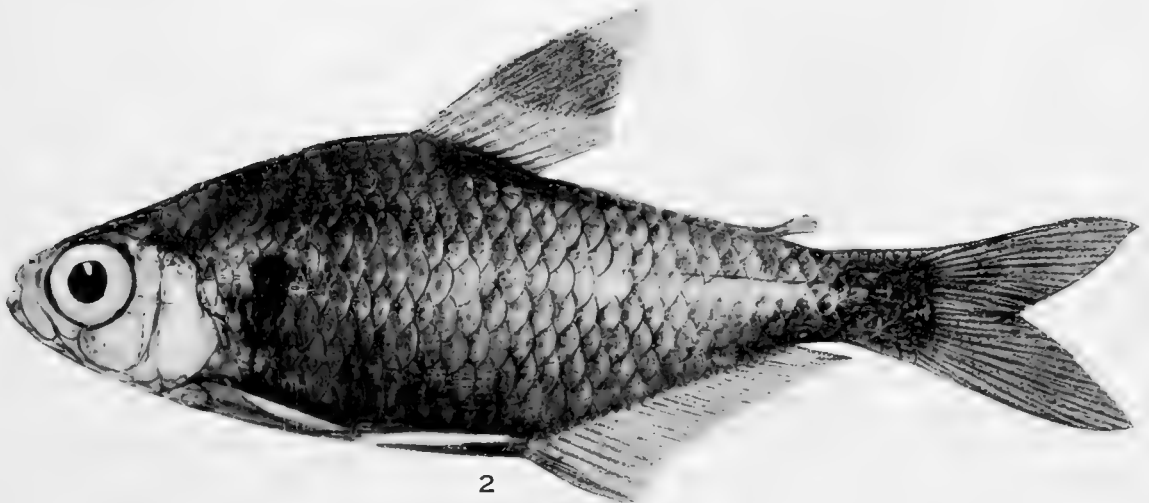
PLATE 25.

PLATE 25.

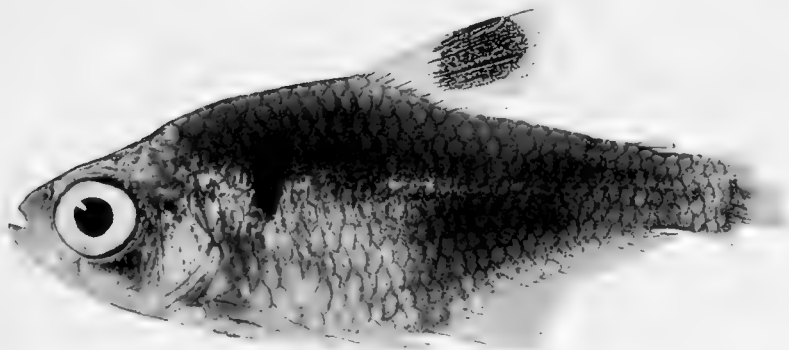
- Fig. 1. *Hyphessobrycon serpae* Durbin.  
20985 M. C. Z. 26 mm. *Type*. Serpa, Brazil.
- Fig. 2. *Hyphessobrycon copelandi* Durbin.  
20771 M. C. Z. 35.5 mm. *Cotype*. Tabatinga, Brazil.
- Fig. 3. *Hyphessobrycon bentosi* Durbin.  
20842 M. C. Z. 38 mm. *Cotype*. Obidos, Brazil.



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PLATE 26.

PLATE 26.

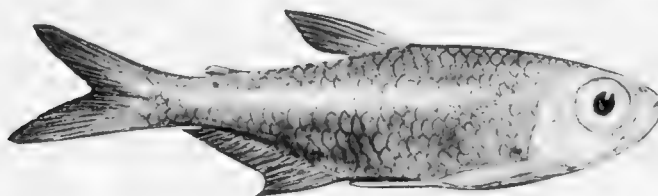
- Fig. 1. *Hyphessobrycon panamensis* Durbin.  
20688 M. C. Z. 31 mm. *Type*. Panama.
- Fig. 2. *Hyphessobrycon gracilis* (Reinhardt).  
21008 M. C. Z. 30 mm. Brazil.
- Fig. 3. *Hyphessobrycon riddlei* (Meek).  
Field Museum. 38 mm. *Type*. Los Castillas, Venezuela.
- Fig. 4. *Hyphessobrycon melazonatus* Durbin.  
20737 M. C. Z. 38 mm. *Type*. Lago do Maximo, Brazil.



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PLATE 27.

PLATE 27.

- Fig. 1, 2. *Hyphessobrycon inconstans* (Eigenmann & Ogle).  
34591 U. S. N. M. *Type, Paratype*. Para?, Brazil.
- Fig. 3. *Hyphessobrycon santae* (Eigenmann).  
3034 C. M. 58 mm. Mogy das Cruzes, Southeastern Brazil.

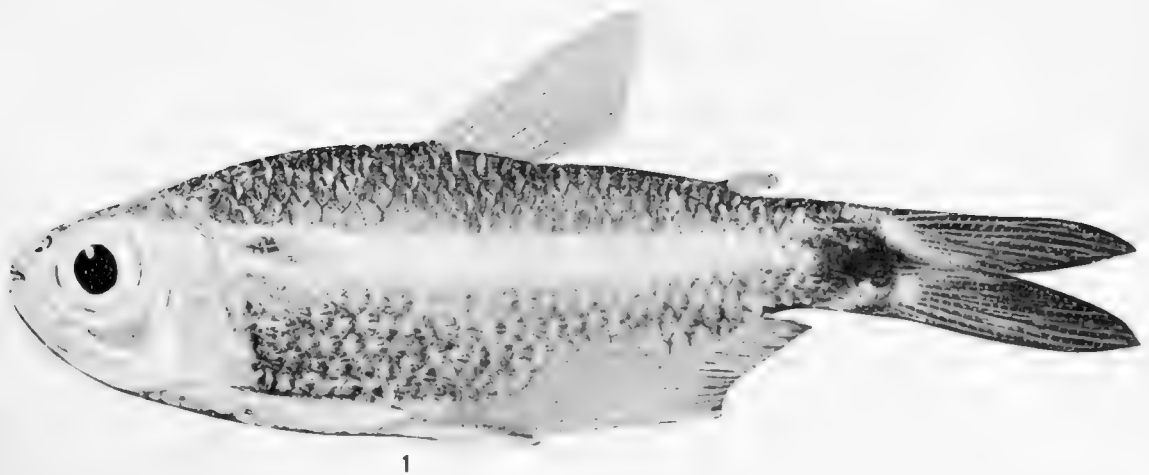
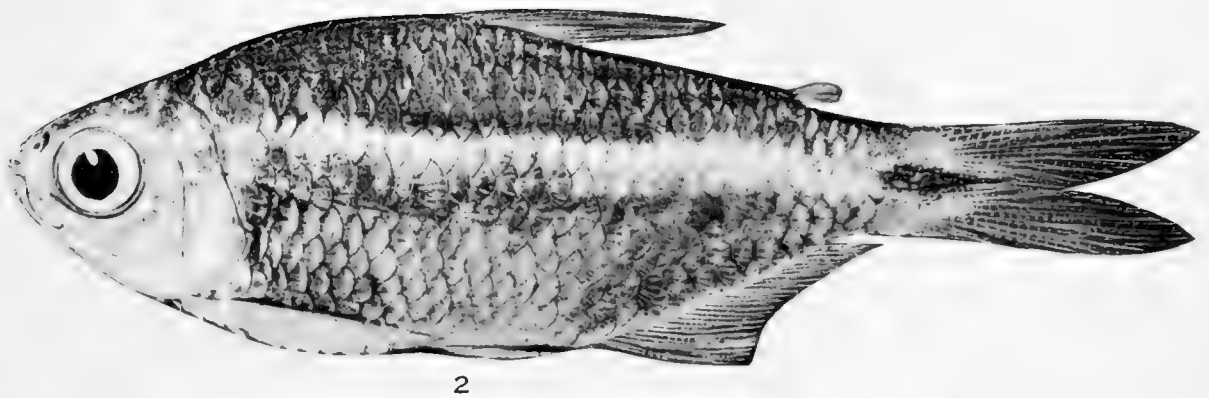
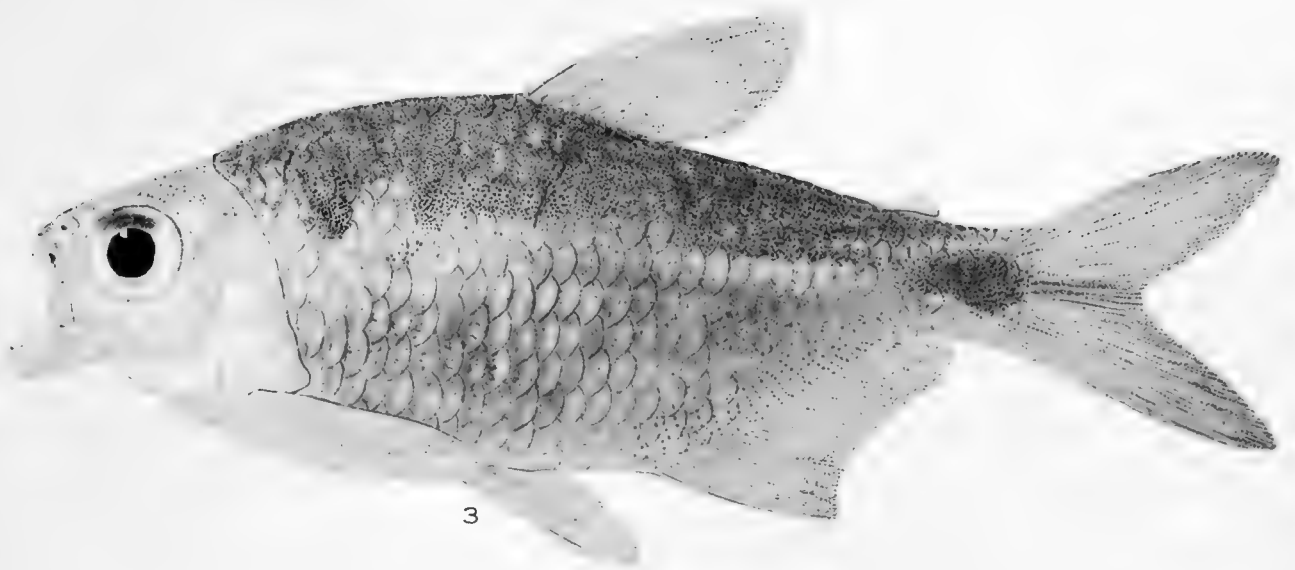






PLATE 28.

PLATE 28.

- Fig. 1. *Hyphessobrycon anisitsi* (Eigenmann).  
3016 C. M. 42 mm. Miguel Calmon, Brazil.
- Fig. 2. *Hyphessobrycon lütkeni* (Boulenger).  
4890 I. U. M. 65 mm. Rio Grande do Sul, Brazil.
- Fig. 3. *Hyphessobrycon heterorhabdus* (Ulrey).  
3004 C. M. 30 mm. Bragança, Brazil.

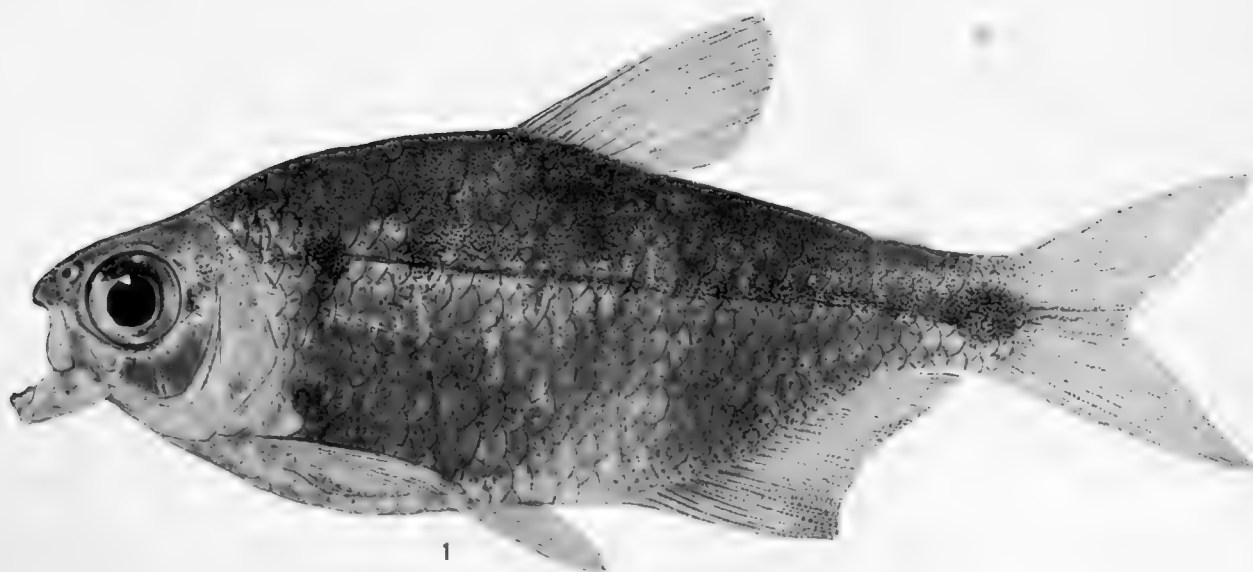
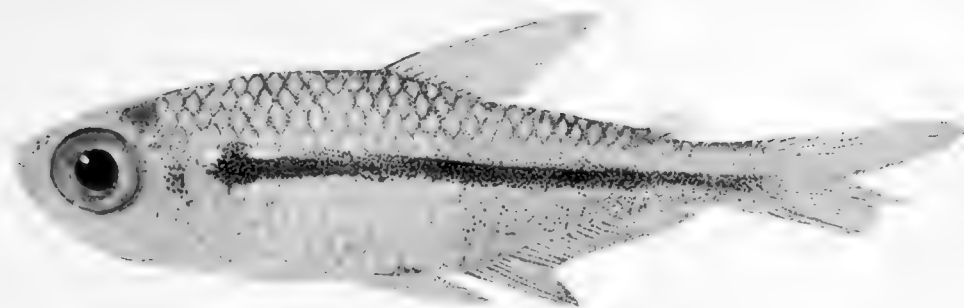
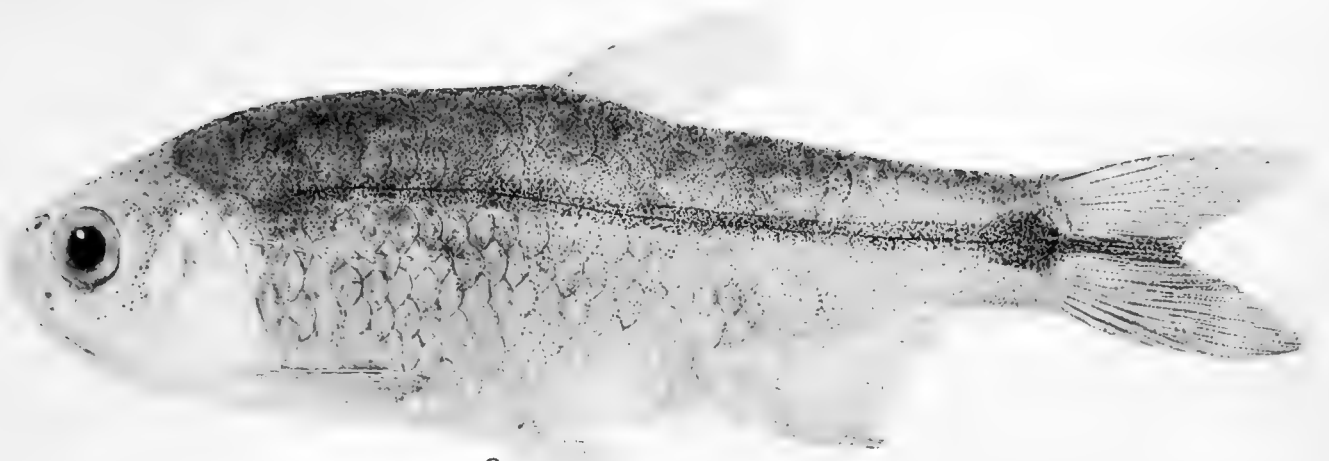




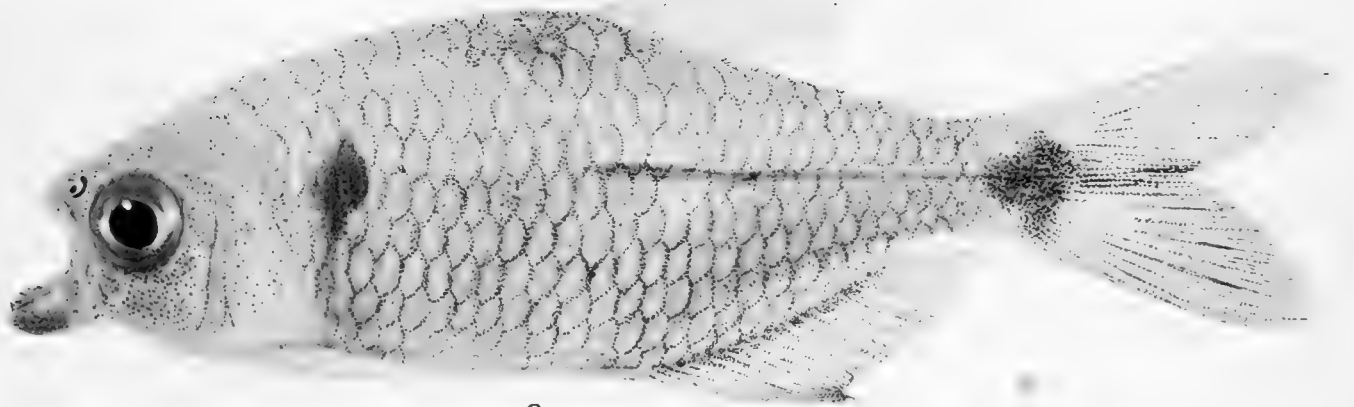
PLATE 29.

PLATE 29.

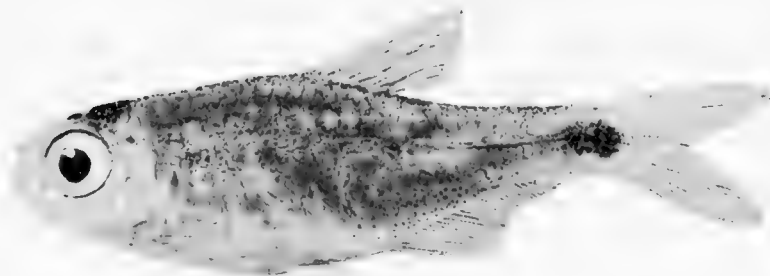
- Fig. 1. *Hyphessobrycon parvulus* Ellis. (Ann. Carnegie mus., 8, Plate 2).  
2932 C. M. 29 mm. *Paratype*. Queimadas, Brazil.
- Fig. 2. *Hyphessobrycon reticulatus* Ellis. (Ann. Carnegie mus., 8, Plate 2).  
3018 C. M. 48 mm. *Type*. Campos, Brazil.
- Fig. 3. *Hyphessobrycon taurocephalus* Ellis. (Ann. Carnegie mus., 8, Plate 1).  
3007 C. M. 55 mm. *Type*. Serrinha Parana, Southeastern Brazil.



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PLATE 33.

PLATE 33.

- Fig. 1. *Hyphessobrycon inconstans* (Eigenmann & Ogle).  
5095 C. M. 62 mm. Quibdo, Colombia.
- Fig. 2. *Hyphessobrycon inconstans* (Eigenmann & Ogle).  
5094 C. M. 74 mm. *Type* of *H. proteus*. Quibdo, Colombia.
- Fig. 3. *Astyanax daguae* Eigenmann.  
5052 C. M. 58 mm. *Type*. Cordova, Colombia.
- Fig. 4. *Hyphessobrycon panamensis* Durbin.  
12849 I. U. M. Boca de Raspadura, Colombia.

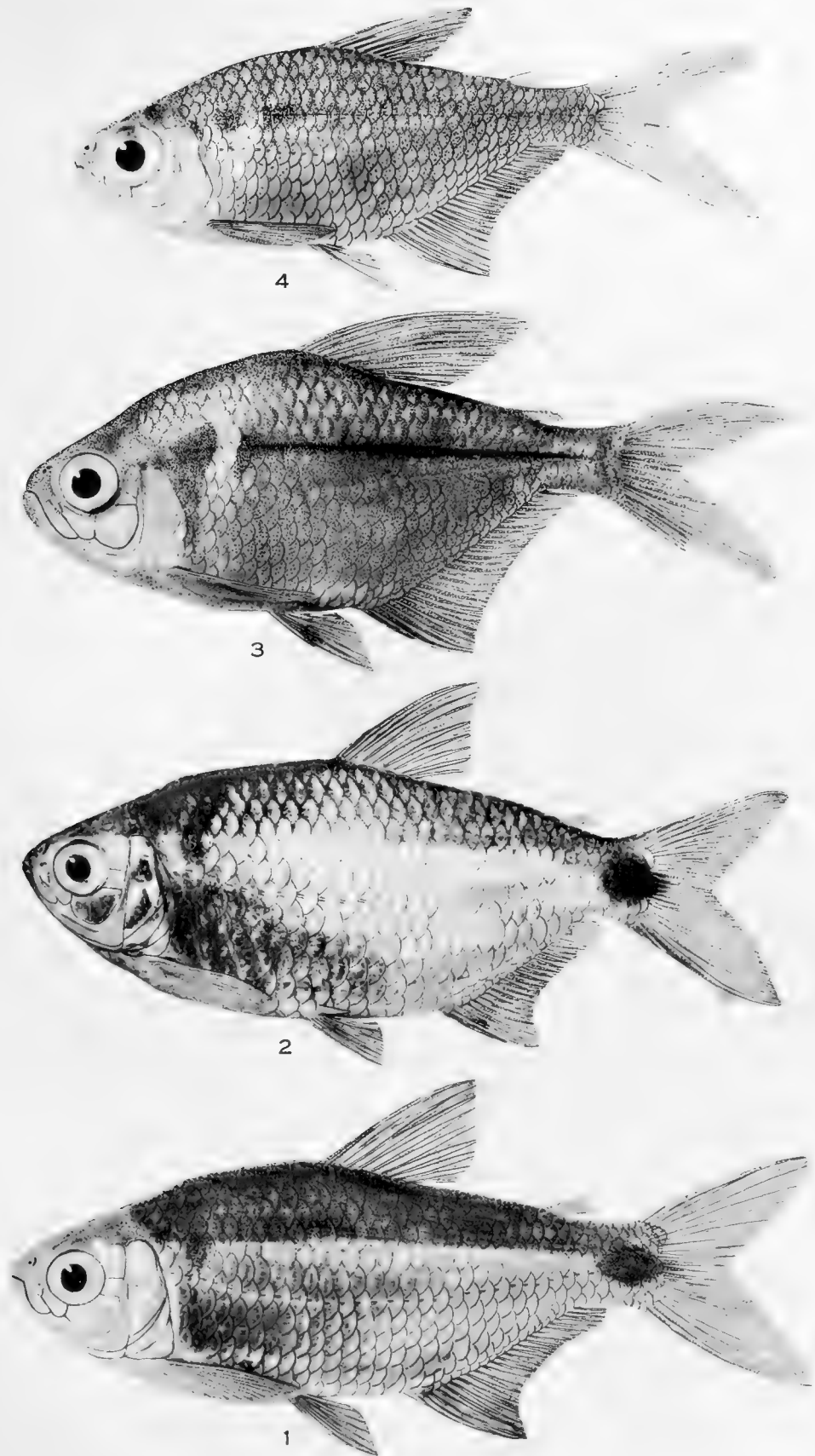




PLATE 78.

PLATE 78.

- Fig. 1. *Hemigrammus schmardae* (Steindachner).  
Maxillary.
- Fig. 2. *Hemigrammus nanus* (Lütken).  
Premaxillary.
- Fig. 3. *Hemigrammus boulengeri* Eigenmann.  
Maxillary.
- Fig. 4. *Hemigrammus tridens* Eigenmann.  
Maxillary.
- Fig. 5. *Hyphessobrycon inconstans* (Eigenmann & Ogle).  
Premaxillary. (For maxillary see Plate 79, fig. 2).
- Fig. 6. *Hemigrammus micropterus* Meek.  
Maxillary.
- Fig. 7. *Hemigrammus nanus* (Lütken).  
Maxillary.
- Fig. 8. *Hemigrammus unilineatus* (Gill).  
Maxillary.
- Fig. 9. *Hemigrammus ulreyi* (Boulenger).  
Maxillary.
- Fig. 10. *Hemigrammus ulreyi* (Boulenger).  
Premaxillary.

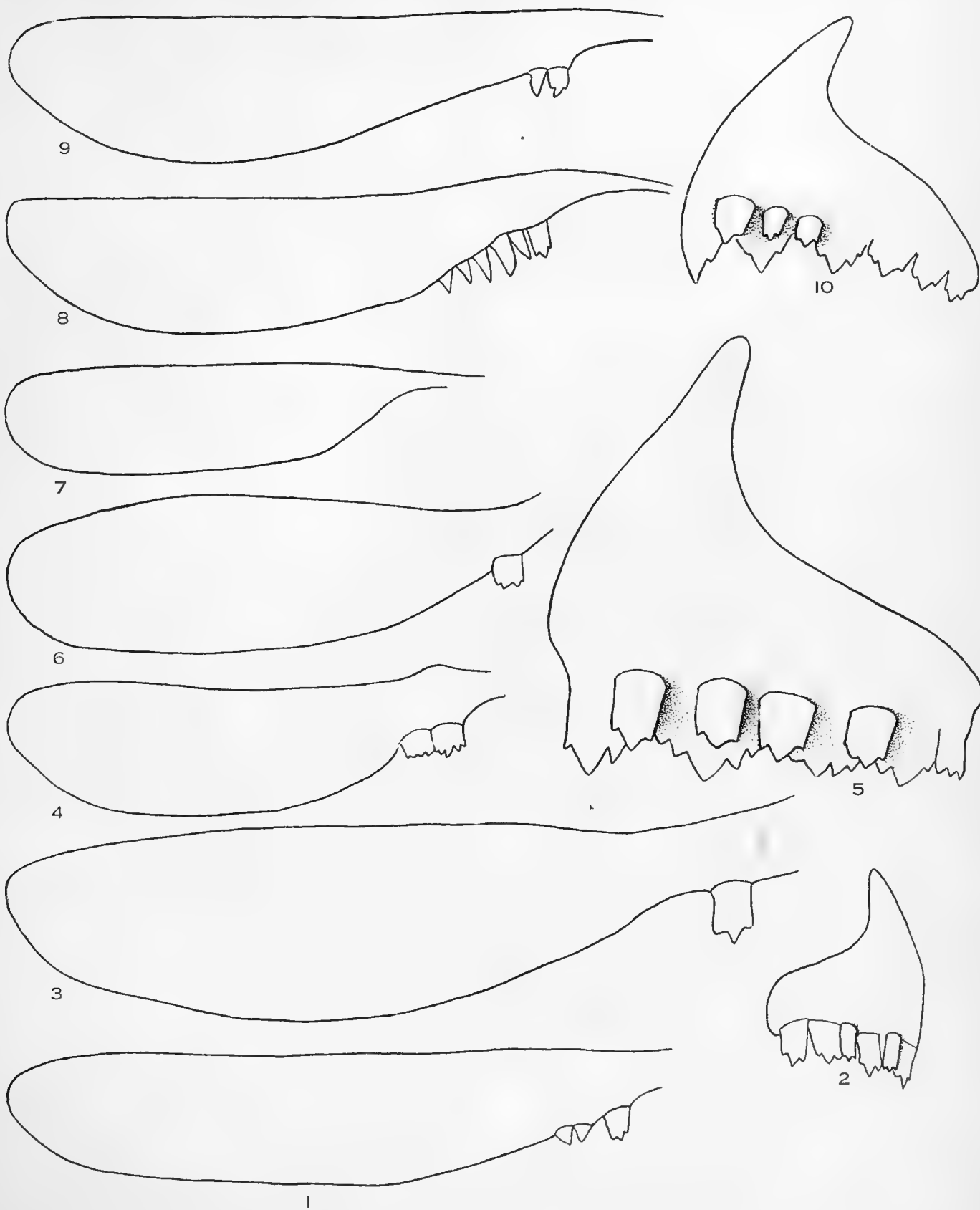






PLATE 79.

PLATE 79.

Dentition.

- Fig. 1. *Hyphessobrycon lütkeni* (Boulenger).  
Maxillary. 9994 I. U. M.
- Fig. 2. *Hyphessobrycon inconstans* (Eigenmann & Ogle).  
Maxillary. 34591 U. S. N. M. (For premaxillary see Plate 78, fig. 5).
- Fig. 3. *Hyphessobrycon santae* (Eigenmann).  
Maxillary.
- Fig. 3a. *Hyphessobrycon santae* (Eigenmann).  
Premaxillary.
- Fig. 4. *Hyphessobrycon anisitsi* (Eigenmann).  
Maxillary.
- Fig. 5. *Hyphessobrycon lütkeni* (Boulenger).  
Maxillary. 4890 I. U. M.
- Fig. 6. *Hyphessobrycon riddlei* (Meek).  
Maxillary.
- Fig. 7. *Hyphessobrycon gracilis* (Reinhardt).  
Maxillary.
- Fig. 8. *Hyphessobrycon bellottii* (Steindachner).  
Maxillary.
- Fig. 9. *Hyphessobrycon bentosi* Durbin.  
Maxillary.
- Fig. 9a. *Hyphessobrycon bentosi* Durbin.  
Premaxillary.
- Fig. 10. *Hyphessobrycon heterorhabdus* (Ulrey).  
Maxillary.
- Fig. 11. *Hyphessobrycon copelandi* Durbin.  
Maxillary.
- Fig. 11a & b. *Hyphessobrycon copelandi* Durbin.  
Premaxillary and mandible.
- Fig. 12. *Hyphessobrycon serpae* Durbin.  
Maxillary.
- Fig. 12a. *Hyphessobrycon serpae* Durbin.  
Premaxillary.
- Fig. 12b. *Hyphessobrycon serpae* Durbin.  
Mandibular teeth.
- Fig. 13. *Hyphessobrycon callistus* (Boulenger).  
Maxillary.
- Fig. 14. *Hyphessobrycon compressus* (Meek).  
Maxillary.
- Fig. 14a. *Hyphessobrycon riddlei* (Meek).  
Premaxillary.

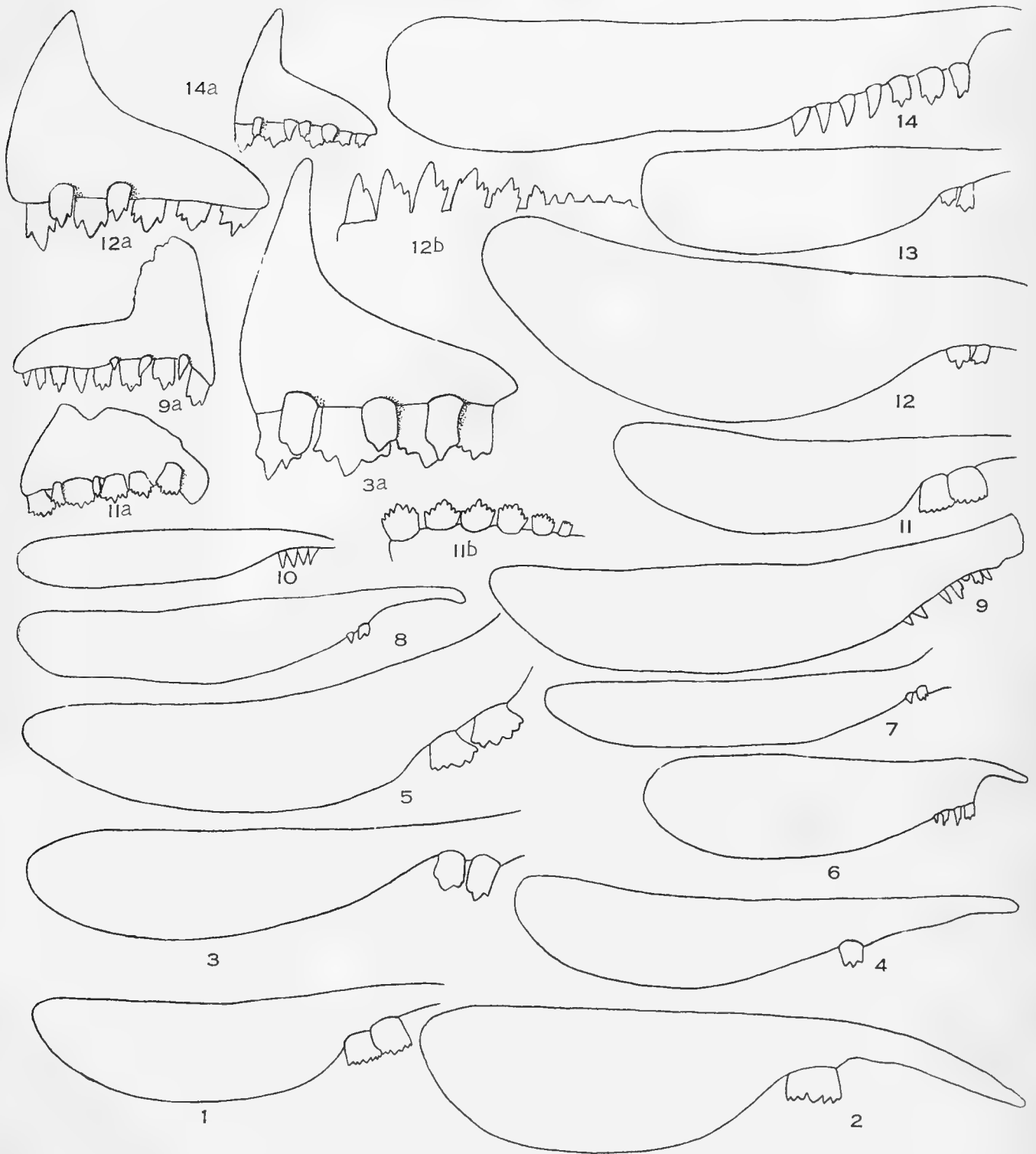




PLATE 80.

PLATE 80.

Dentition.

*Thayeria obliqua* Eigenmann.

- Fig. 1. Premaxillary.
- Fig. 2. Maxillary.
- Fig. 4. Mandibular teeth from within.
- Fig. 6. Mandibular teeth from without.

*Hemibrycon dentatus* Eigenmann.

- Fig. 3. } arrangement of the teeth in the first row of the premaxillary in seven different specimens.
- Fig. 5. } Piedra Moler, Colombia.
- Fig. 7-11. } (See also Plate 76).

*Creagrutus magdalenae* Eigenmann.

- Fig. 12. Mandibular teeth from the side.
- Fig. 13. Mandibular teeth from above.
- Fig. 14. Right maxillary.
- Fig. 15. Premaxillary teeth from below.
- Fig. 16. Left maxillary.

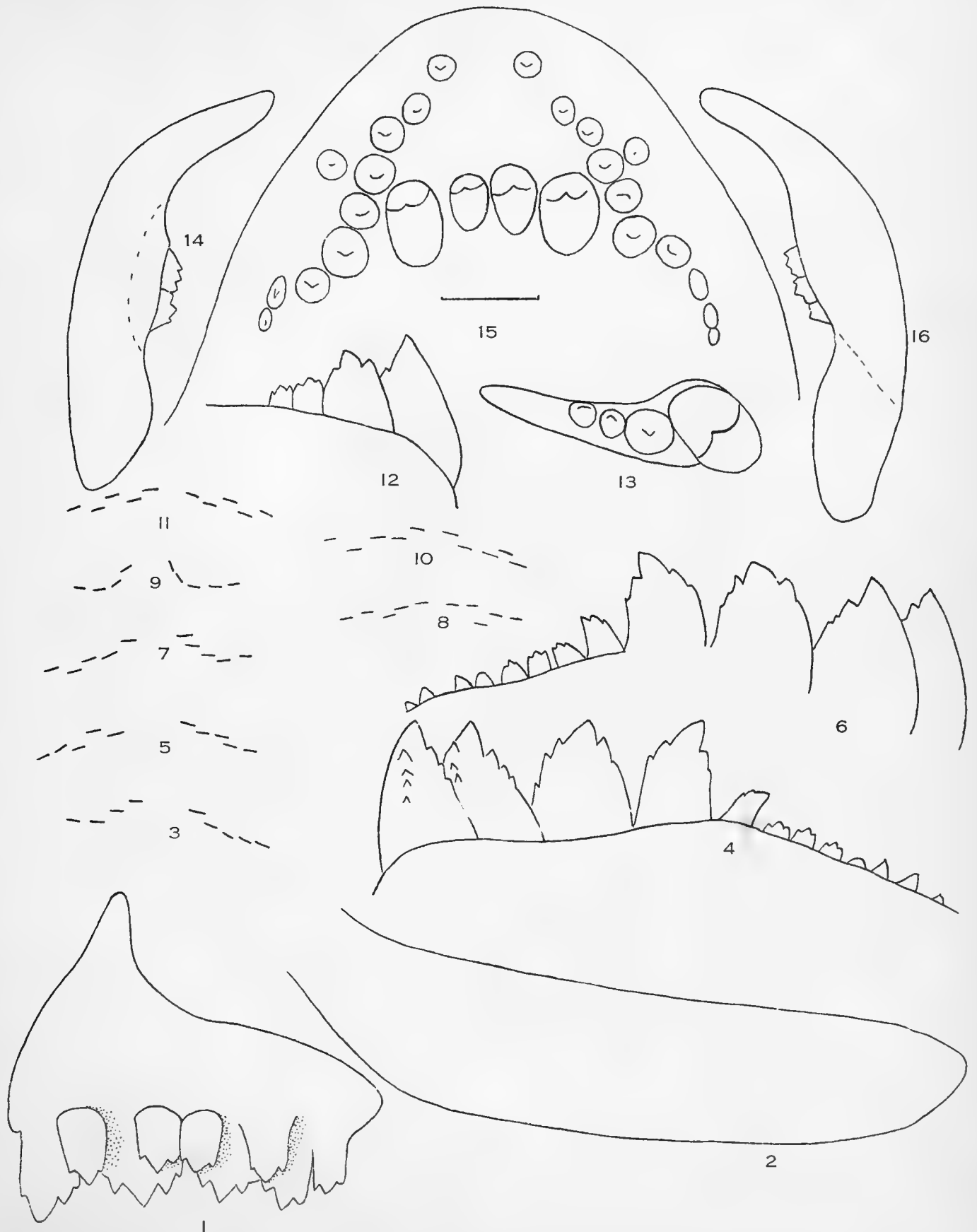






PLATE 93.

PLATE 93.

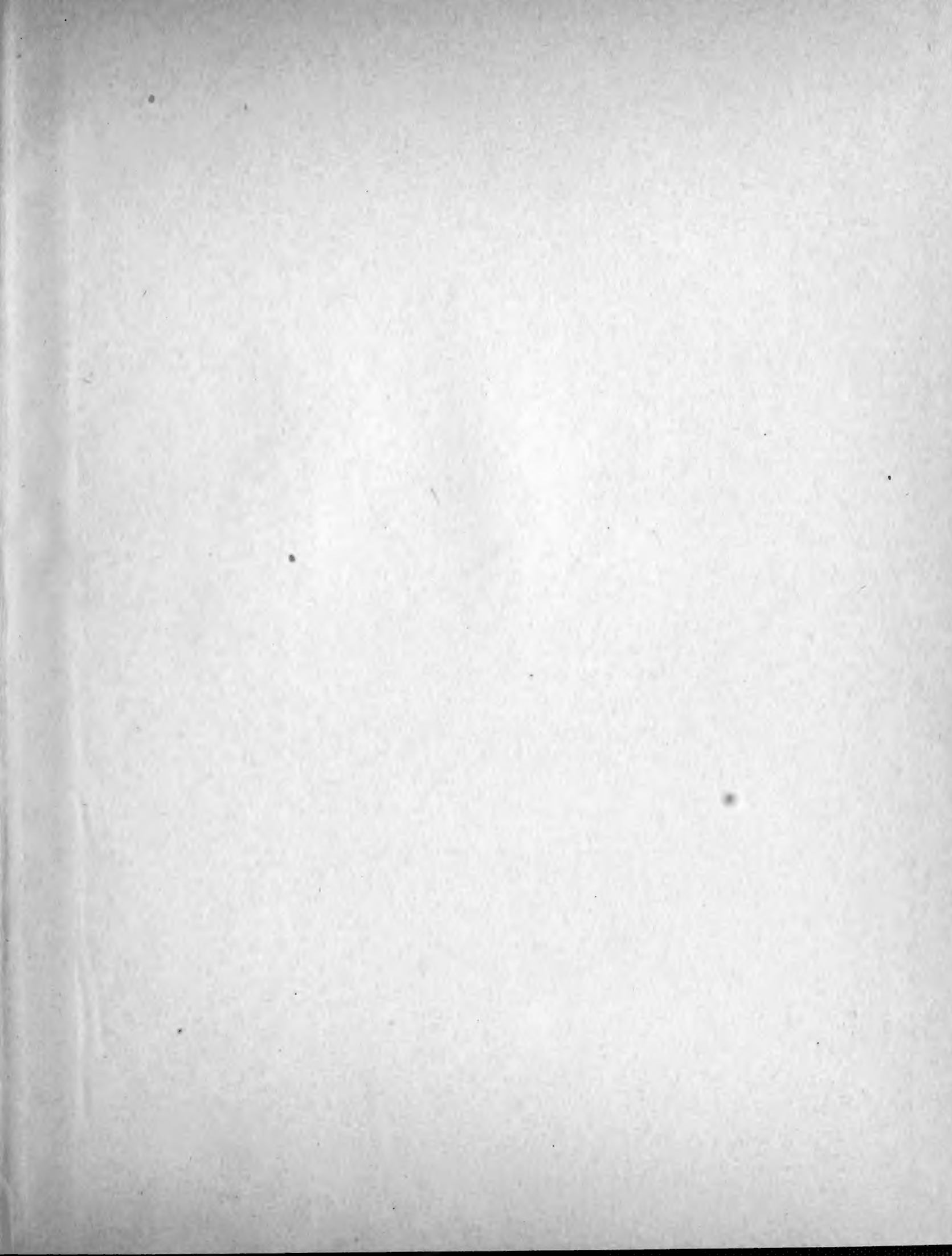
- Fig. 1. *Bryconamericus brevirostris* (Günther).  
13123 I. U. M. 82 mm. Colimes, Ecuador.
- Fig. 2. *Hemigrammus barrigona* Eigenmann & Henn.  
13423 I. U. M. 41 mm. *Type*. Barrigona, Colombia.
- Fig. 3. *Hyphessobrycon metae* Eigenmann & Henn.  
13421 I. U. M. 34 mm. *Type*. Barrigona, Colombia.
- Fig. 4. *Creagrutus beni* Eigenmann.  
Premaxillary and maxillary teeth. 3216 C. M. *Type*. Rio Beni, Bolivia.
- Fig. 5. *Creagrutus beni* Eigenmann.  
Premaxillary and maxillary teeth. Quevrada Gramalote, Villacencio, Colombia.
- Fig. 6. *Hyphessobrycon ecuadoriensis* Eigenmann & Henn.  
13105a I. U. M. 31 mm. Vines, Ecuador.
- Fig. 7. *Creagrutus beni* Eigenmann.  
13373 I. U. M. 66 mm. Barrigona, Colombia.















Plates

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